

RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY

**New Theories of Addiction:
Beyond Dopamine and the Reward Center**

Jennifer Buckman, PhD
Fiona Conway, PhD

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Introductions

- Who are we?
- Who are you?
- What do you do?
- Prior addiction science education?

HELLO
my name is
Jen

HELLO
my name is
Fiona

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CAUTION
CONTAINS
SCIENCE
@NOLLS.ORG

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WARNING
NO EASY
ANSWERS
AHEAD

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CHANGING ADDICTIVE BEHAVIOR

Bench to Bedside and Back Again

28th 50th COLLABORATIVE PERSPECTIVES ON ADDICTION Feb 28 - March 1 | Atlanta, GA

SOCIETY OF ALCOHOL PSYCHOLOGY PREVIOUSLY AMERICAN SOCIETY OF ALCOHOLISM

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Course Outline

- Topic 1: What is Science, Addiction, and Addiction Science?
- Topic 2: Incentive Sensitization Theory
- Topic 3: Somatic Marker Theory
- Topic 4: Three Stages of Addiction Theory
- Topic 5: Theories = Answer?

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What is science?

- Knowledge or understanding acquired by study (Oxford English Dictionary, 2014)
- The scientific method:
 - An approach for acquiring new knowledge
 - Based on systematic and comprehensive observation
 - All knowledge is tentative and subject to refutation. (Rubin & Babbie, 2016)

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    graph TD
      A[Ask a question] --> B[Construct a hypothesis]
      B --> C[Test with experiments]
      C --> D[Analyze the results]
      D --> E[Formulate a conclusion]
    
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The Fields of Science (as considered by method)

- Behavioral/Clinical Science:
 - Social Work[†]
 - Psychology*
 - Sociology
- Biological/Medical Science:
 - Neuroscience*
 - Human genetics
 - Physiology
- Natural Science:
 - Biology
 - Chemistry
 - Physics

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The Fields of Neuroscience (as considered by concept/process)

Affective neuroscience*	Molecular neuroscience*	Paleoneurology
Behavioral neuroscience*	Neuroengineering	Social neuroscience*
Cellular neuroscience	Neuroethology	Systems neuroscience*
Clinical neuroscience*	Neuroheuristics	
Cognitive neuroscience*	Neuroimaging*	
Computational neuroscience	Neuroinformatics	
Cultural neuroscience	Neuroinformatics	
Developmental neuroscience	Neurophysics	
Evolutionary neuroscience	Neurophysiology	
	Neuropsychology*	

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Addiction Science?

- Bio-psycho-social?
 - Body physiology
 - Neuroanatomy, neurochemistry, neurophysiology
 - Hormones
 - Nutrition and metabolism
 - Cognitive psychology
 - Behavior
 - Affect and emotions
 - Family
 - Culture
 - Society

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Definition of Addiction

How do you define Addiction?




- Would you use the word "pleasurable"?

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Definition of Addiction

- A chronic, relapsing **brain disease** that is characterized by compulsive substance seeking and use, despite harmful consequences.
- "Addiction" is replaced by **Substance Use Disorder (SUDs)** in DSM-5.
 - Defined as problematic patterns of use of intoxicating substances leading to clinically *significant impairment or distress*.
 - Manifested by 2+ of 11 symptoms in the following areas - impaired control, social impairment, risky use, and pharmacological criteria (i.e., tolerance and withdrawal). Craving is new!

(National Institute on Drug Abuse, 2016)



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DSM-5 and biology

1. Taking larger amounts or for longer than the you mean to.
2. Wanting to cut down or stop, but can't
3. Spending a lot of time getting, using, or recovering from use
4. Cravings and urges to use the substance
5. Not managing to do what you should at work, home or school
6. Continuing to use, even when it causes problems in relationships
7. Giving up important social, occupational or recreational activities
8. Using substances again and again, even when it puts you in danger
9. Continuing to use, even when you know you have a physical or psychological problem that could have been caused or made worse
10. Needing more of the substance to get the effect you want (tolerance)
11. Development of withdrawal symptoms, which can be relieved by taking more of the substance

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Importance of defining Addiction

- Stigma, stigma, stigma
- Research “phenotype”
 - Can you model in an animal?
 - Can you lump everyone with an addiction together as a ‘group’ compared to ‘controls’?
 - Polydrug users
- Treatment
 - If it's a brain disease, then pharmaceutical companies will be enticed to study (good/bad?)
 - Is it moral, mood, cognitive ... what is treatment approach

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Importance of defining Addiction

- ... definition remains ‘loose’
 - Everyone thinks they “know it when they see it”
 - “You don't look like an addict, here are 30 Vicodin for your minor pain.”
- ... research impact on treatment/clinical practice is SLOW, INCOMPLETE ...
 - Are scientists outsiders?
 - Are their questions/answers irrelevant?
 - Is what you are doing good enough?
 - IMPLEMENTATION SCIENCE

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Epidemiology is a science

Alcohol Disease Burden

- Alcohol is responsible for one in every 10 deaths of Americans aged 20 to 64.
- Alcohol use is the fourth leading preventable cause of death in the United States.
- An estimated 16.3 million adults (ages 18 and older) had an Alcohol Use Disorder
- Nearly 88,000 people die from alcohol-related causes annually

(2014 SAMHSA National Survey on Drug Use and Health)

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Epidemiology defines the magnitude of the problem

Drug Use Disease Burden

- An estimated 27 million Americans aged 12 or older used an illicit drug in the past month.
- Treatment Gap: In 2013, an estimated 22.7 million Americans needed treatment for a problem related to drugs or alcohol, but only about 2.5 million people (10 percent) received treatment at a specialty facility.
- Each year, more than \$181 billion is lost to substance abuse of illicit drugs in the United States. Those losses are realized across the board — in health care costs, the criminal justice system, and productivity-related areas.

(2014 SAMHSA National Survey on Drug Use and Health)

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Epidemiology points to the details of the problem

This Is Where People Are Drinking Themselves To Death

On average, about one in 10 deaths among working-age people in the U.S. can be attributed to alcohol. These causes of death include violence, alcohol poisoning and motor vehicle collisions, as well as conditions like breast cancer and heart disease.

Percent of deaths that were alcohol attributable for persons ages 20-64, 2006-2010

7-9% 9.1-11% 11.1-13% 13.1-15%

Source: Centers for Disease Control THE HUFFINGTON POST

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PRISON POPULATION

Of the 2.3 million inmates in the US, more than half have a history of substance abuse and addiction.

A rehabilitation program saved my life in 1995. That program was state funded at the time. Thirty other death row inmates, the program I attended closed it's doors. I truly believe had I not done 90 days in rehab, prison would have been a part of my future.

Most of those inmates that remained in US drug rehab centers during their early years, those who did not attend in 2007, 2013 or many years later, were the ones that had the most serious substance abuse problems.

We followed up individuals for criminal treatment in their adult lives. 71.5% of individuals received the best chance of future change. 28.5% did not receive any form of treatment and returned to prison within 30 months, according to the CDC.

The cost of getting an addict through rehab is roughly 25% the cost of keeping them in prison. \$26,000 for prison, \$6,000 for rehab.

Richard Nixon coined the phrase "The War On Drugs" in 1971. The first anti-drug legislation.

\$100 MILLION allocated for rehab, far less expensive than the drug war has gotten.

31x

\$26K

\$6K

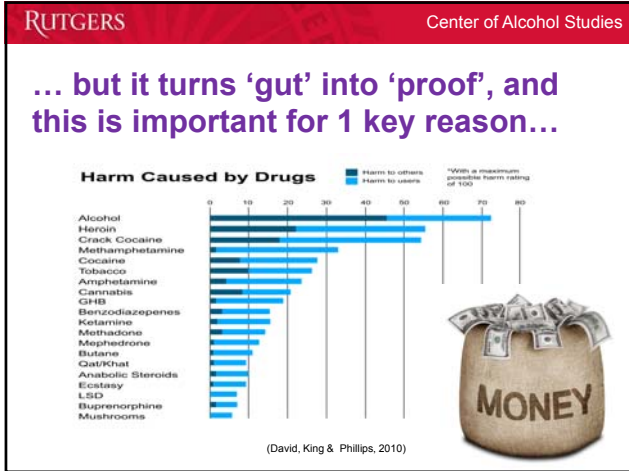
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Sometimes science needs numbers to know what treatment providers already know...

Types of Illicit Drug Use in the Past Month Persons Aged 12 or Older (2014)

Drug Type	Number of Persons
Marijuana use (incl. hash)	22,000,000
Heroin (incl. crack/cocaine)	2,201,000
Ecstasy	4,623,000
Heroin	1,875,000
Cocaine	1,570,000
Heroin	1,155,000
Ecstasy	1,137,000
Ecstasy	605,000
Heroin	269,000
Heroin	246,000
Heroin	132,000
Heroin	102,000
Cocaine	594,000
Heroin	220,000
Heroin	781,000
Heroin	0

(2014 SAMHSA National Survey on Drug Use and Health)



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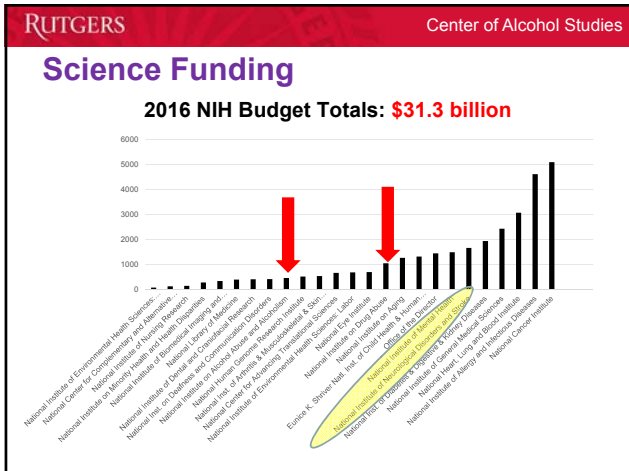
Science Funding

– The national medical research agency
 – Part of the U.S. Department of Health and Human Services
 – Made up of 27 different Institutes and Centers.

The National Institutes of Health

Office of the Director

Source: NIH, www.nih.gov



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- ### What scientists ponder...
- What is it?
 - Where does it come from?
 - Why do only some people get it?
 - Can you prevent it?
 - Can you stop it from getting worse?
 - Can you treat it/reverse it?
 - Can you eradicate it?

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What behavioral neuroscientists and psychologists ponder...

- Can the complexity of human behavior be deconstructed into its component parts?
- What part of what behavior is dysfunctional?
- Is a behavioral disruption permanent?
 - If so, can it be compensated for?
 - If so, can we develop effective strategies for remedy?
- What is the neural basis?
- Is there a role for pharmacology?
 - Neither psychology nor pharmacology is sufficiently fine-tuned nor nuanced.
- Are our techniques adequate to answer our questions?
 - Neuroimaging – can you really say something about a person laying in a cold, sterile room inside a giant magnet making horrible sounds?

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What addiction scientists ponder...

<ul style="list-style-type: none"> • What is it? • Where does it come from? • Why do only some people get it? • Can you prevent it? • Can you stop it from getting worse? • Can you treat it/reverse it? • Can you eradicate it? 	<ul style="list-style-type: none"> • Is addiction a fundamentally personal experience/process that no two individuals develop, experience, or physical display in the same way?
<ul style="list-style-type: none"> • Can complexity of human behavior be deconstructed? • What part of behavior is dysfunctional? • What is the neural basis? • Is a behavioral disruption permanent? <ul style="list-style-type: none"> – Can it be compensated for? – Can we develop effective strategies? • Is there a role for pharmacology? • Are our techniques adequate? 	<ul style="list-style-type: none"> • With so much competing dysfunction, can any one behavioral intervention 'correct' all dysfunctions simultaneously? • Is addiction a human condition? • What types of experiments can be performed in humans?

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What we should ponder this week...

- Where does it begin?
 - With the first drug experience?
 - Do you believe in the "gateway" hypothesis?
 - Does the first drug you are exposed to pave the way?
 - Tobacco, alcohol, marijuana
 - Sugar?
 - Does the inevitable legalization of marijuana give you pause?
 - If so, why?
 - Do you believe that drugs are difficult or easy to access?
 - Does it impact addiction liability?

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What we should ponder...

- Where does it begin?
 - Susceptibility?
 - Genes
 - One, a few, a ton. A bunch of combinations?
 - Environment
 - Family, friends, circumstances
 - Exposure
 - If you are never exposed to drugs (is that possible?), would you try to find them (glue sniffing)?
 - Can multiple mental health conditions "substitute" for one another?

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What we should ponder...

- What supports continued use?
- When does use become abuse?
 - Can it be non-problematic for a long time?
 - Can it go between problematic and non-problematic?
 - Is it a faster/steeper trajectory in true addiction?
- Do trajectories of use point to addiction subtypes?
 - Do you believe that there is 1 unifying definition or a homogeneous group of addicts?
 - If not, what defines subgroups, age of onset, type of drug, trajectory?

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What we should ponder...

- Drug of choice
 - How many people use just one drug?
 - How many addicts use just one drug?
 - What makes one drug a favorite?
 - Is it the person seeking the 'missing' element?
 - Is it the first euphoric exposure?
 - Upper/downer?
 - Why are drug epidemics cyclical/generational?
 - Can you substitute addictions?
- How do behavioral addictions factor in?

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What we should ponder...

- Do our current treatments work?

Treatment	N	CI
Placebo	8	38%
MET	8	38%
AA	10	38%
MET	10	38%
CBT	10	38%
CBT	10	38%
Family	10	38%
Group/Manual	10	38%

Of 536 participants in 6 trials, 59% of people receiving LSD reported lower levels of alcohol misuse, compared to 38% of people who received a placebo.

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What we should ponder...

- Do our current treatments work?

[Tom McLellan](#)

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Evidence-based vs. empirical support

evidence-based medicine

the Japanese eat a low fat diet and have lower rates of cardiovascular disease than the English and Americans

the French eat a high fat diet and have lower rates of cardiovascular disease than the English and Americans

the Chinese drink little alcohol and have lower rates of cardiovascular disease than the English and Americans

the Italians drink much alcohol and have lower rates of cardiovascular disease than the English and Americans

evidence-based conclusions?
eat and drink whatever you want
it's speaking English that kills you

courtesy of Dr. Peter Liu, University of Toronto

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Evidence-based vs. empirical support

- EBP – an approach that tries to specify the way in which professionals or other decision-makers should make decisions by identifying such evidence that there may be for a practice and rating it according to how scientifically sound it may be. Its goal is to eliminate unsound or excessively risky practices in favor of those that have better outcomes.
- EST - "clearly specified psychological treatments shown to be efficacious in controlled research with a delineated population"

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Evidence-based vs. empirical support

- Evidence from 2+ settings that treatment is superior to no treatment = EFFICACIOUS
- Evidence from 2+ settings that treatment is superior to a pill/psychological placebo or other treatment = EFFICACIOUS AND SPECIFIC

The term "evidence-based practice" is not always used in such a rigorous fashion, and many psychologists claim to follow "evidence-based approaches" even when the methods they use do not meet established criteria for efficacy.

- Lack of training in EBP
- Reduces quality of care

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Evidence-based vs. empirical support

- **Efficacy** - explanatory trials to determine whether an intervention produces the expected result under ideal circumstances
- **Effectiveness** - pragmatic trials to measure the degree of beneficial effect under "real world" clinical settings
- Cost-effectiveness
- Systematic review, meta-analysis, & integrated data analysis

References

Substance Abuse and Mental Health Services Administration (SAMHSA). 2014 National Survey on Drug Use and Health (NSDUH). Table 5.8A—Substance dependence or abuse in the past year among persons aged 18 or older, by demographic characteristics: Numbers in thousands, 2013 and 2014. Available at: <http://www.samhsa.gov/data/sites/default/files/NSDUH-DeTTab52014/NSDUH-DeTTab52014.htm#tab5-8a>

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