

Cognitive and Personality Risk Factors for Addictions – From Biological Markers to Novel Targets for Prevention and Intervention

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VCU

VIRGINIA COMMONWEALTH UNIVERSITY

Objectives

- Diagnostic frameworks / Heterogeneity of addictions
- Main risk factors for developing addiction
- Personality risk factors for addictions
- Prevention and intervention programs targeting personality factors
- Neurocognitive risk factors and consequences of addictions
- Prevention and intervention programs based on neuroscience
- Empirical research and results from Bulgaria

DSM-5 criteria for substance use disorders

1. Substance is often taken in larger amounts or over a longer period than intended
2. Persistent desire or unsuccessful efforts to cut down or control use
3. A great deal of time is spent in activities necessary to obtain, use, or recover from the effects of the substance
4. Craving, or a strong desire or urge to use
5. Recurrent use resulting in a failure to fulfill major role obligations at work, school, or home
6. Continued use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance
7. Important social, occupational, or recreational activities are given up or reduced because of the substance
8. Recurrent use in situations in which it is physically hazardous
9. Use is continued despite knowledge of having a persistent or recurrent physical problem that is likely to have been caused or exacerbated by the substance
10. Tolerance
11. Withdrawal

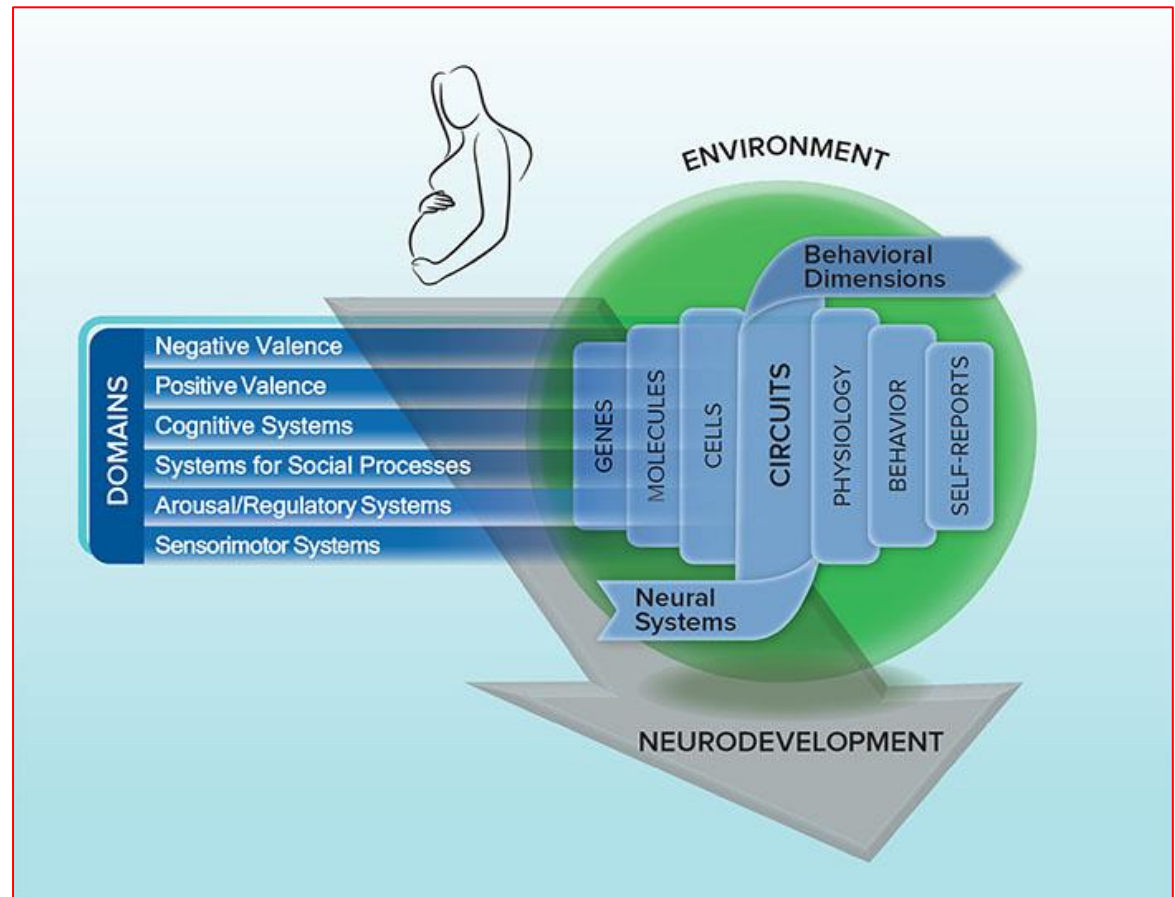
Problems with DSM-5 diagnoses of addictions

- Don't reflect the clinical heterogeneity of addictions:
 - Within the diagnosis (syndrome)
 - Between diagnoses (comorbidity)
- Don't reflect the heterogeneity of the etiological mechanisms for addictions
- Don't predict the outcome of treatment → explains why many therapies do not work equally for everyone

Don't reflect the revolutionary advances in neuroscience and the neurobiological basis of addictions

Alternative diagnostic methods based on neuroscience Research Domain Criteria (RDoC)

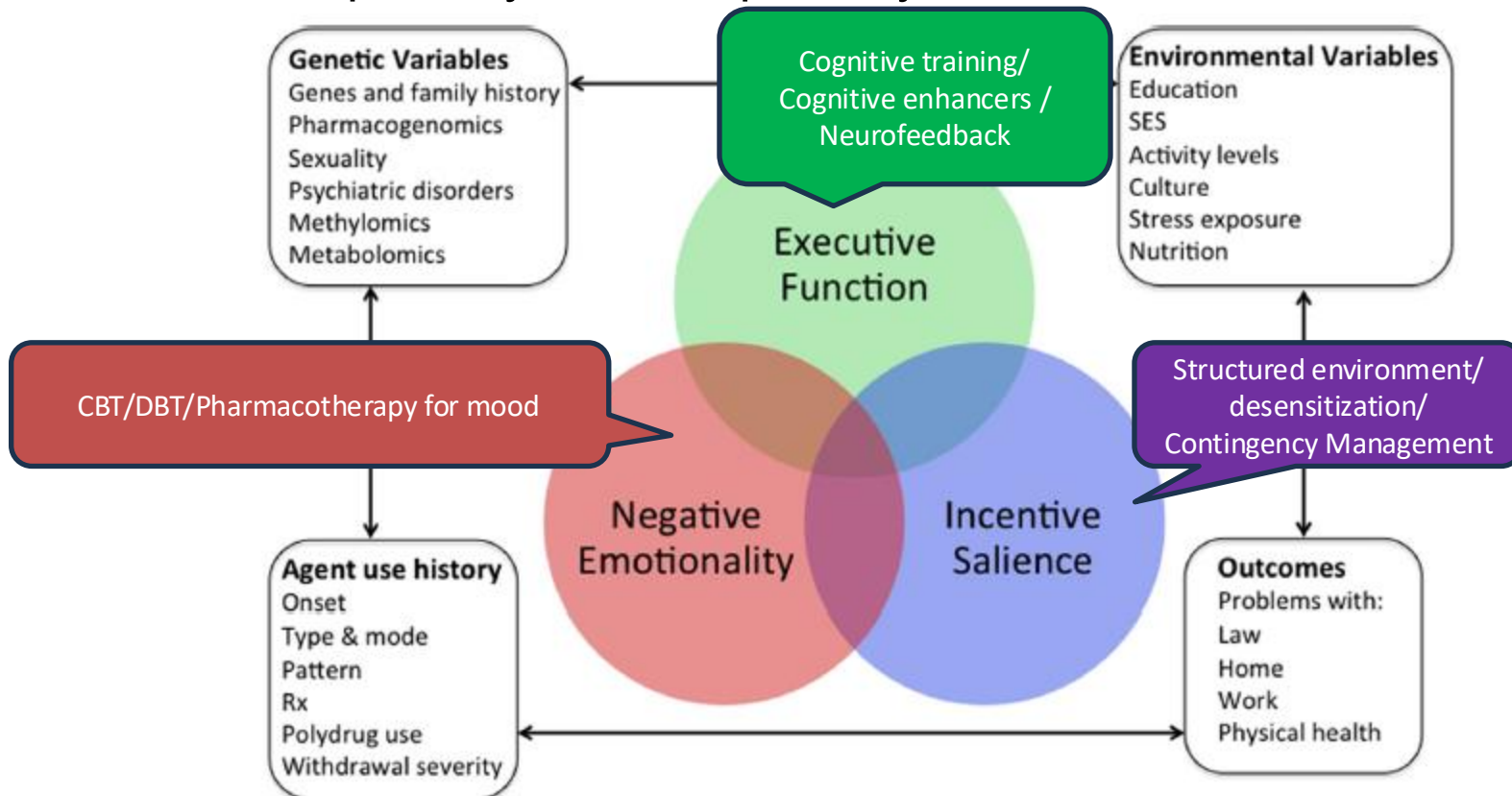
- Negative Valence Systems
- Positive Valence Systems
- Cognitive Systems
- Social Processes
- Arousal and Regulatory Systems
- Sensorimotor Systems



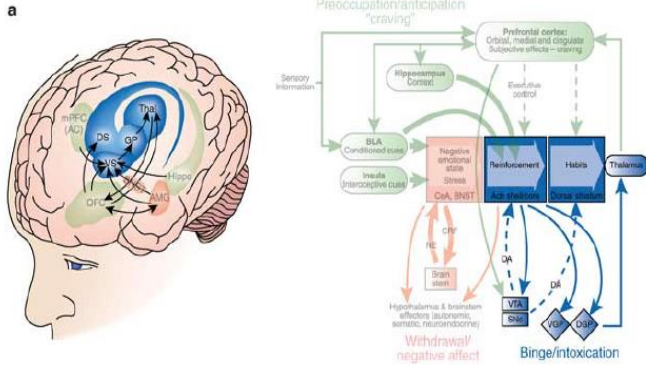
RDoC for Addictions

Addictions Neuroclinical Assessment (ANA)

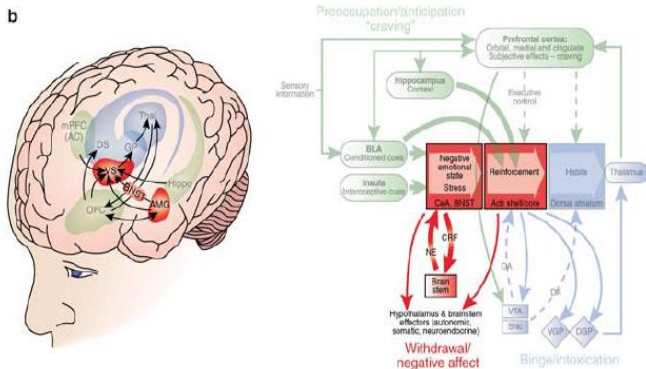
In order to address the heterogeneity of addiction, the successful treatment must accommodate the different etiological mechanisms of addiction, by performing multidimensional assessments that probe 3 neurofunctional domains of impulsivity and compulsivity:



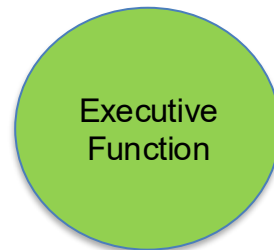
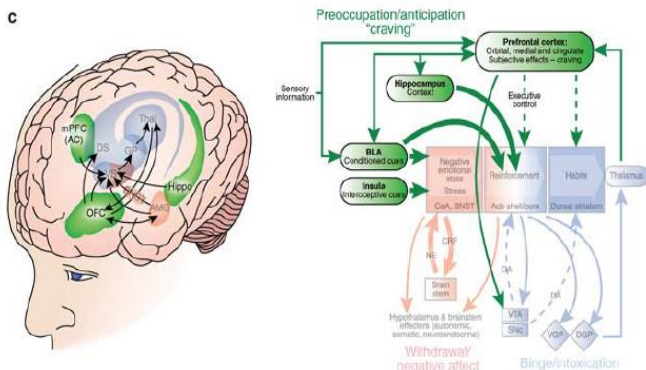
Stages of Addiction



Binge / Intoxication Stage
Reward, Incentive Saliency
 Basal Ganglia
Stimulants

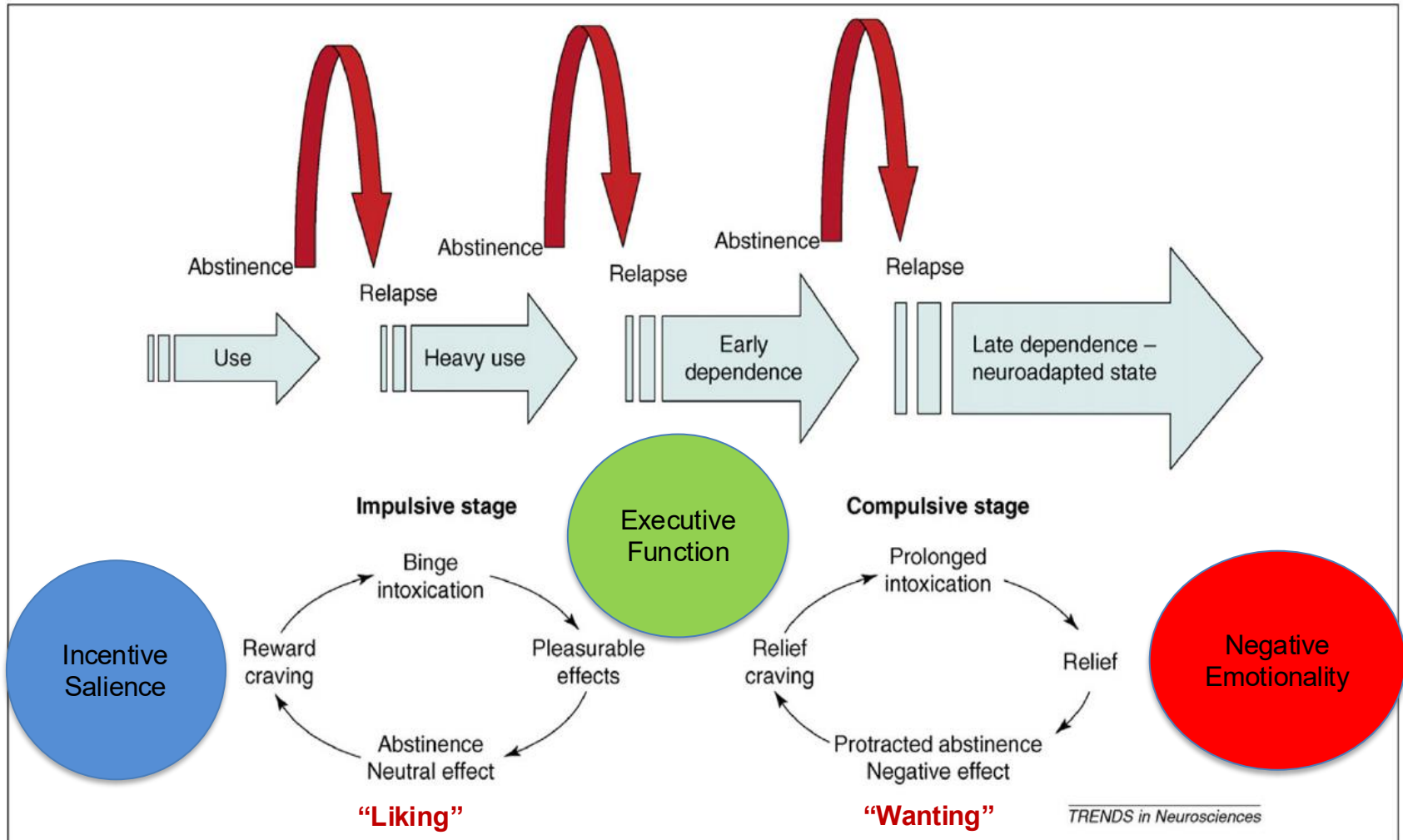


Withdrawal / Negative Affect Stage
Stress
 Amygdala / Ventral Striatum
Opioids



Preoccupation / Anticipation (Craving) Stage
 Executive Functions,
Inhibitory Control
 OFC, mPFC, insula
Nicotine

Change in motivational mechanisms as addiction develops - Transition from impulsivity to compulsivity



Development of Addiction

- Volitional Use → Compulsive Use
- Impulsivity → Compulsivity
- Liking → Wanting
- Positive reinforcement mechanisms → Negative reinforcement mechanisms
- Craving reward → Craving relief

Addiction as a Brain Disease

Early Models

- Tolerance
- Withdrawal

Current Models

- Loss of control
- Impulsivity
- Compulsivity
- Negative affectivity

What causes addiction?

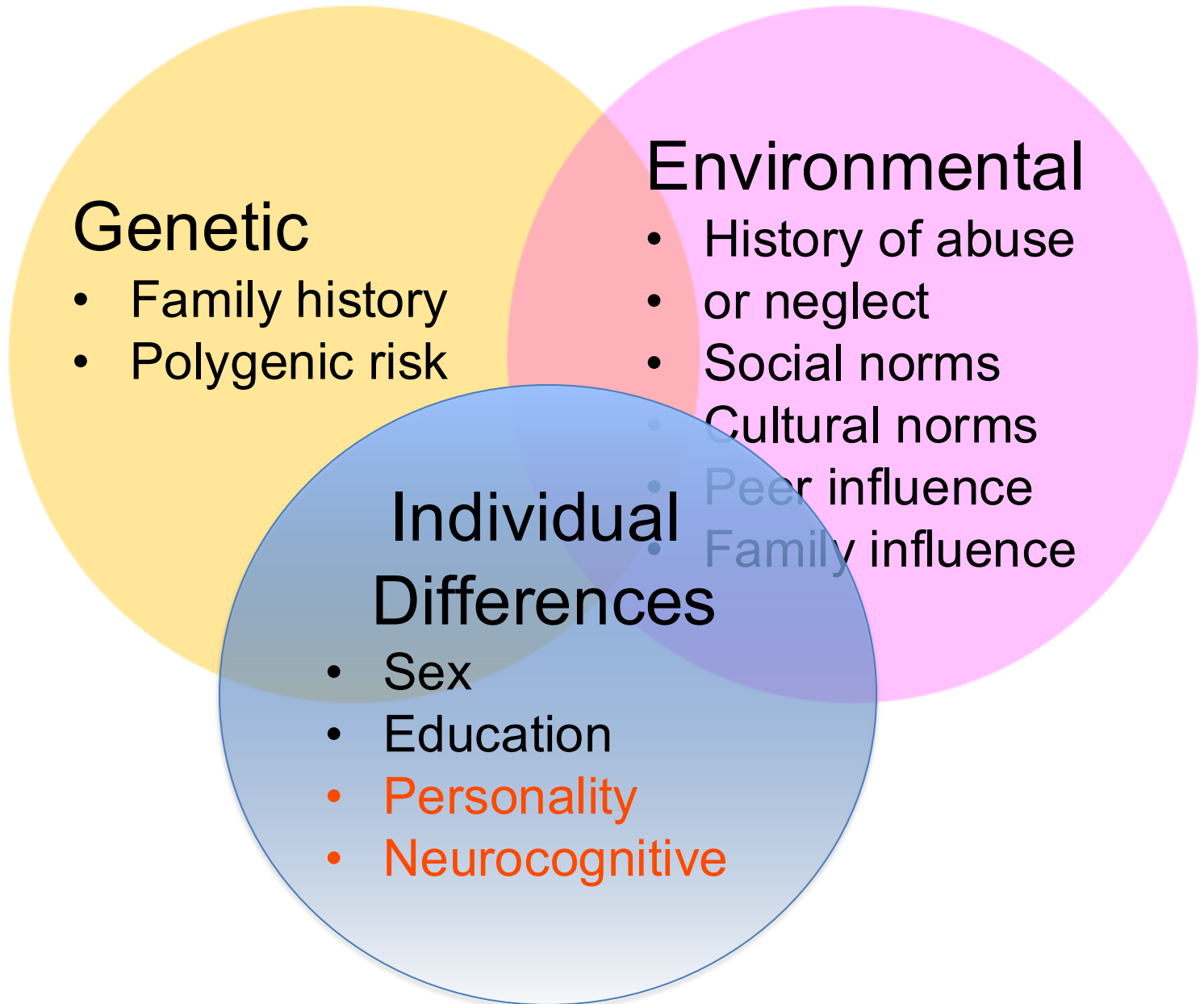
Genes



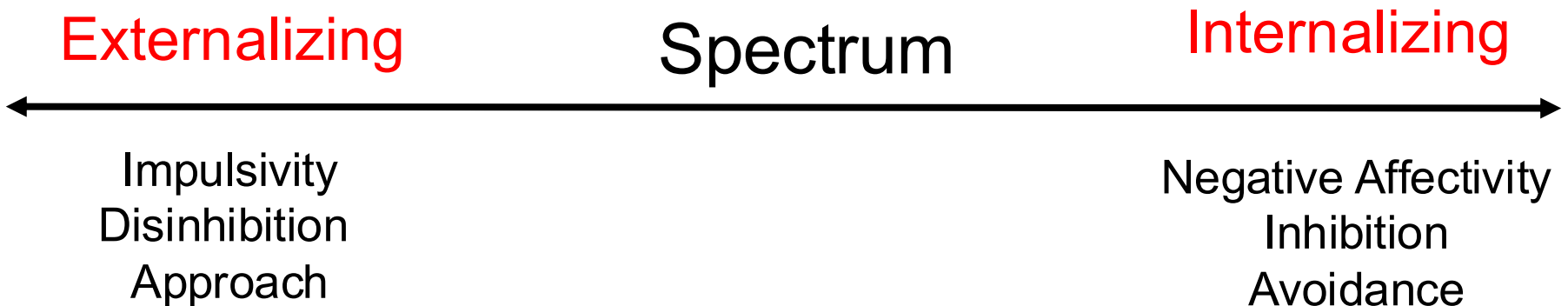
Environment



Multimodal Risk Factors



Two Broad Domains of Personality and Psychopathology



Pervasive & Temporally Stable

The Personality Continuum

Adaptive

Maladaptive



Personality
Traits

- Impulsivity - Neuroticism
- Extraversion - Introversion
- Sensation Seeking – Harm Avoidance
- Disinhibition - Inhibition
- Reward Sensitivity – Loss Aversion

Personality / Psychiatric
Disorders

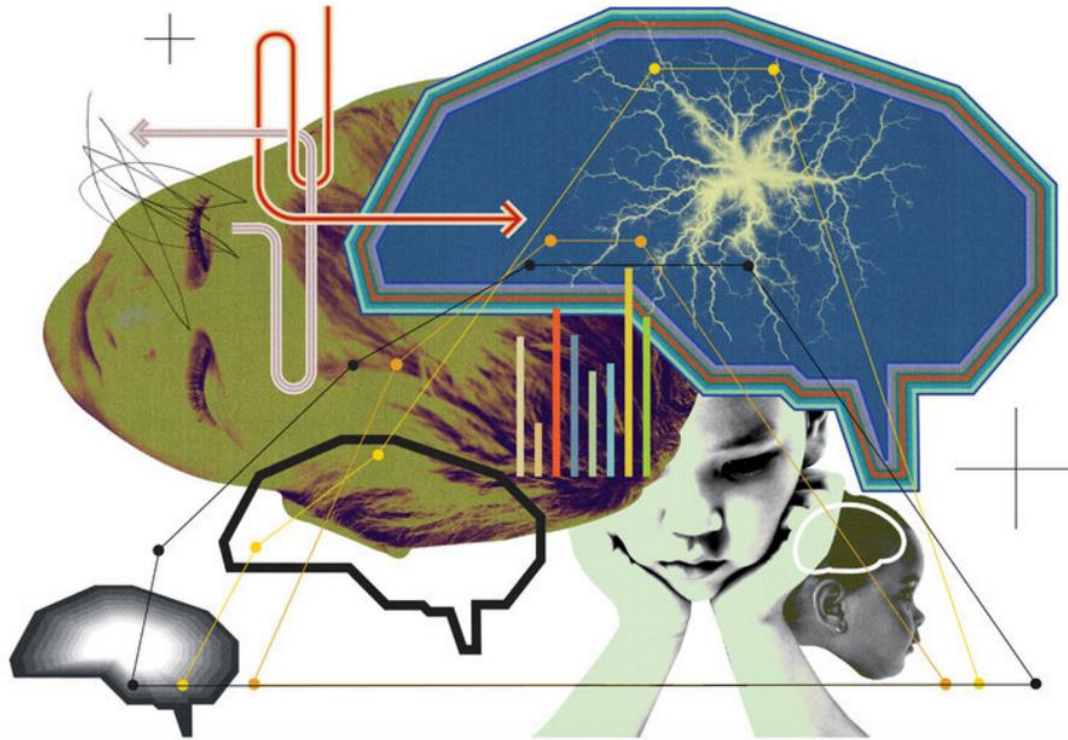
- SUD
- CD, ODD, ADHD
- BPD, ASPD, Psychopathy
- Affective/mood disorders
- Anxiety disorders

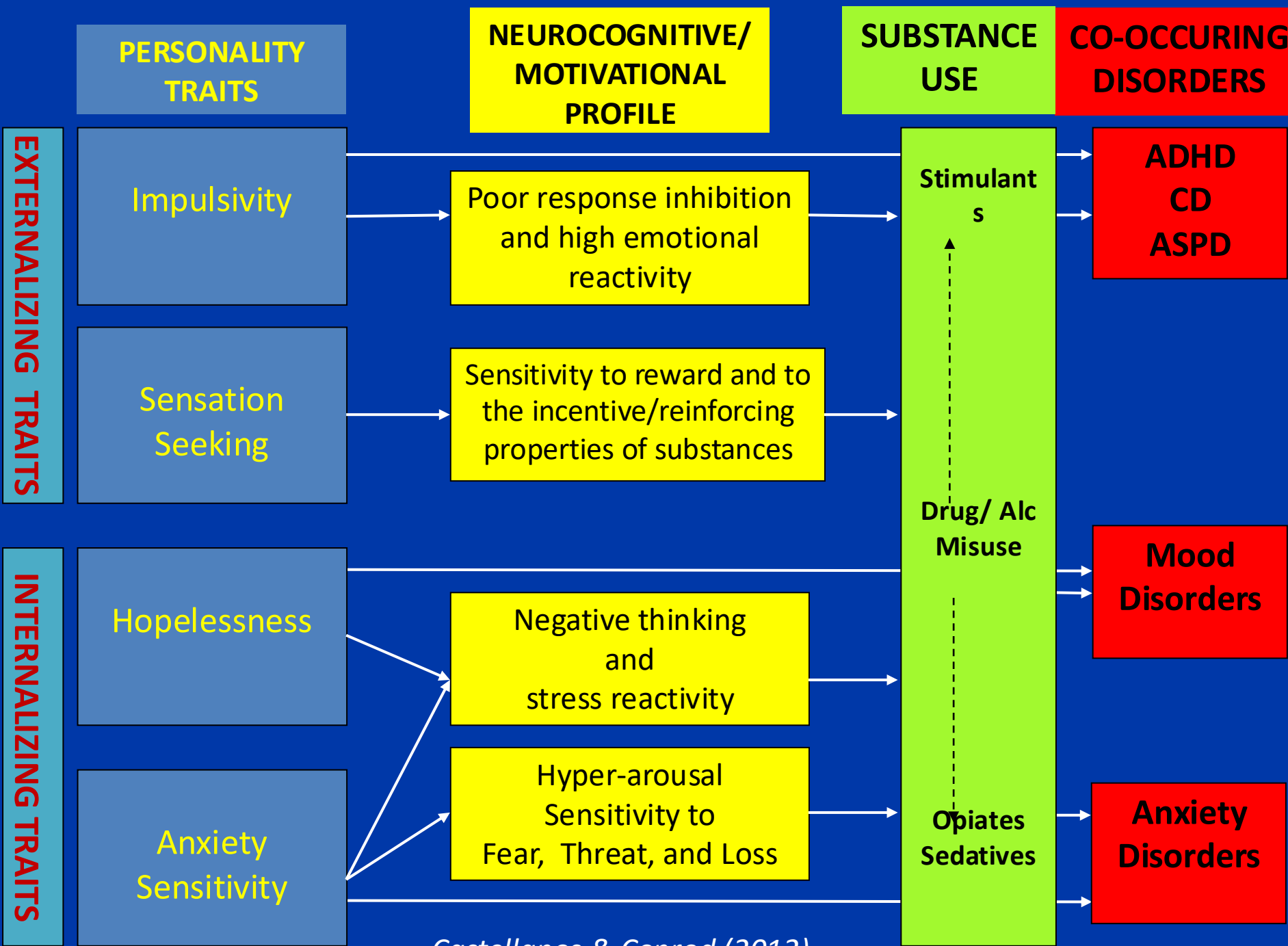
Personality Risk Factors for Addiction

WELL | FAMILY

The 4 Traits That Put Kids at Risk for Addiction

By MAIA SZALAVITZ SEPT. 29, 2016





Castellanos & Conrod (2012)



The substance use risk profile scale: A scale measuring traits linked to reinforcement-specific substance use profiles

Patricia A. Woicik^{a,*}, Sherry H. Stewart^b, Robert O. Pihl^c, Patricia J. Conrod^{d,*}

- NEO Five-Factor Inventory (*Costa & McCrae, 1992*)
- Beck Depression Inventory (*Beck, et al., 1961*)
- Beck Hopelessness Scale (*Beck, 1988*)
- Anxiety Sensitivity Index (*Reiss et al., 1986*)
- Sensation Seeking Scale (*Zuckerman, 1979*)
- Venturesomeness and Impulsiveness (*Eysenck & Eysenck, 1978*)



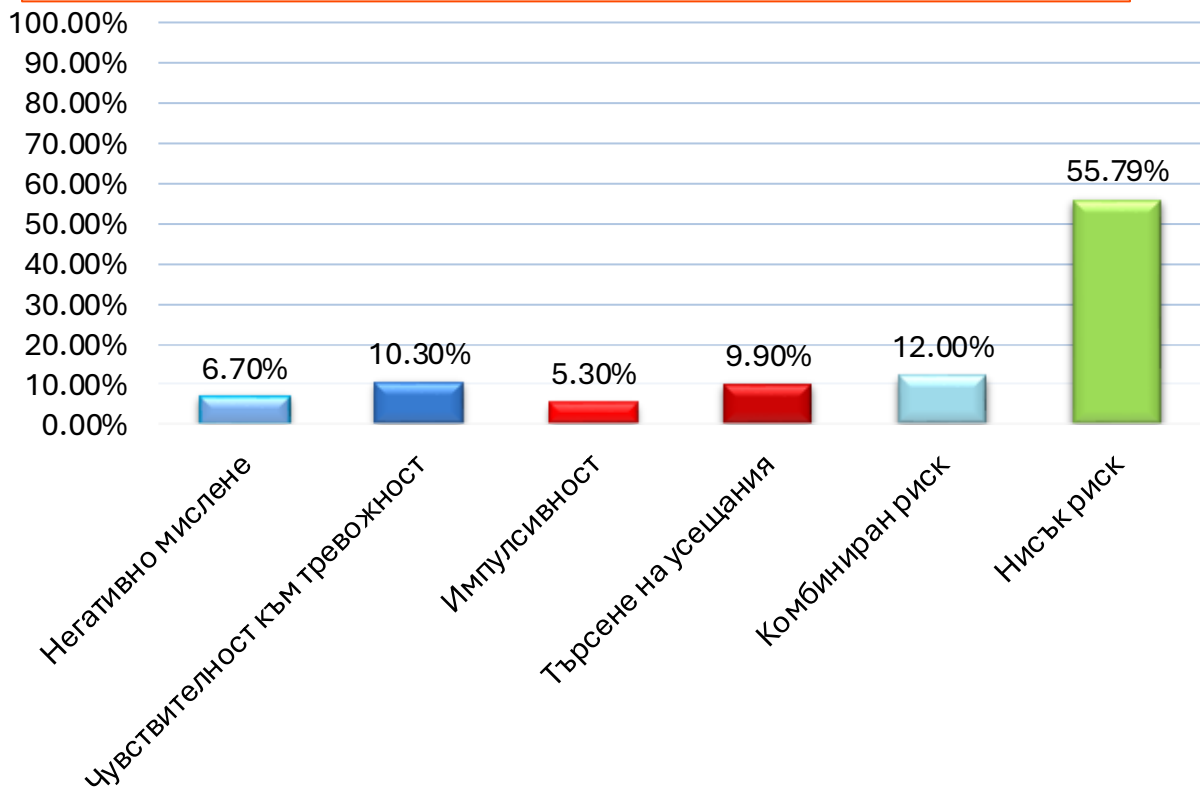
Validation of the Substance Use Risk Profile Scale (SURPS) With Bulgarian Substance Dependent Individuals

Elizabeth C. Long^{1†}, Svetla Milcheva^{2†}, Elena Psederska^{3,4}, Georgi Vasilev³, Kiril Bozgunov³, Dimitar Nedelchev³, Nathan A. Gillespie^{5,6} and Jasmin Vassileva^{1,7*}



Психометрични характеристики на скалата за оценка на рисков профил за употреба на наркотични вещества (Substance Use Risk Profile Scale (SURPS) сред български юноши, ходещи на училище

Е. Пседерска^{1,2}, Г. Василев^{1,3}, Д. Неделчев¹, Ю. Георгиева³,
К. Бозгунов¹, Ж. Василева^{4,5}



Risk Profiles among Bulgarian Adolescents

- N = 475 high-school students (12-14 year old)
- 217 ♂ 248 ♀
- Risk Profiles: +1SD above the school mean
- **44.21%** – elevated values on at least 1 of the 4 risk factors

Personality-based Prevention

The PreVenture Program



- Selective
- Brief (two 90-minute workshops)
- Administered at schools
- Group format
- Emphasis on skills building
- Manualized

www.preventureprogram.com



introduction to impulsivity

An impulsive person acts on the spur of the moment without thinking much about the consequences of their actions. When you feel as if you are being treated unfairly, are frustrated or are angry, you might experience a lack of control and may say or do something that you later regret.

how much do you agree with the following statements?

1 - strongly disagree **2** - disagree **3** - agree **4** - strongly agree

- I often don't think things through before I speak.
- I often involve myself in situations that I later regret.
- I usually act without stopping to think.
- Generally, I am an impulsive person.
- I feel I have to be crafty and manipulative to get what I want.
- Add your total to determine your level of impulsivity.

under 9 = low 9-14 = medium 14 and above = high

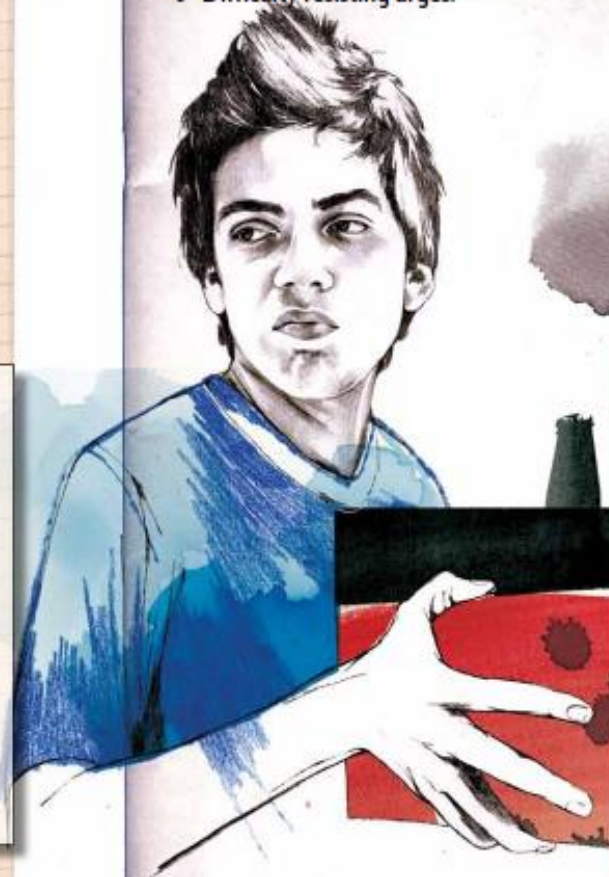


What does impulsivity mean to you?

CHARACTERISTICS OF

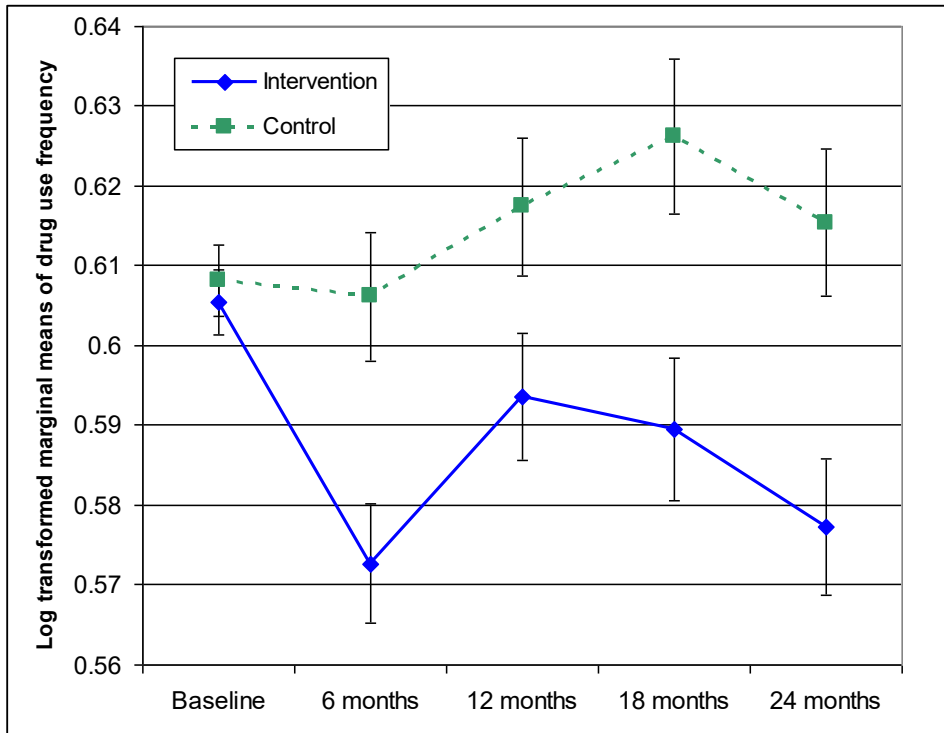
impulsivity

- 1 Strong-minded and easily frustrated.
- 2 Acting or speaking without thinking much about what could happen.
- 3 Sometimes getting involved in situations that you later regret.
- 4 Being or feeling angry or aggressive and sometimes acting on it.
- 5 Sometimes feeling as if you are being treated unfairly.
- 6 Difficulty resisting urges.



MARK'S father owns a restaurant, and Mark gets paid to help move deliveries to the storage room. Mark hates the job—it's hard and boring, and he sometimes misses out on fun stuff. Plus, his dad always points out the things he does wrong and that makes him resent the job even more. One afternoon, Mark's friends show up and want him to come hang out. Mark doesn't want to be stuck in this dark back room alone when he could be out doing something fun. He tenses up. *This is so unfair!* he thinks. He angrily kicks a box and hears a bottle break. "Great. Dad will take this out of my pay. I don't deserve this!" he mutters. Feeling like he's going to explode, he grabs a case of beer and leaves with friends.

Efficacy of PreVenture



Duration of Effects on Substance Use

- Up to 7+ years after program completion

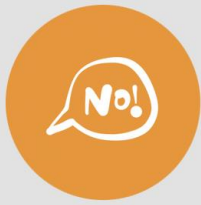
Alcohol and Substance Use

- Delayed onset of alcohol and substance use.
- Reduction in:
 - Alcohol and substance use (Conrod et al., 2008; 2010)
 - “Herd effects” (Conrod et al., 2013)

Mental Health

Reduction of:

- Symptoms of depression and anxiety (O’Leary-Barrett et al., 2013)
- Conduct problems, impulsivity (Perrier-Ménard et al., 2017)
- Bullying and victimization (Kelly et al., 2020)



50% Reduction in Drug Use



50% Reduction in Alcohol Use



30% Reduction in Tobacco Use



50% Reduction in Alcohol Harms



Reduction in Anxiety and Depression



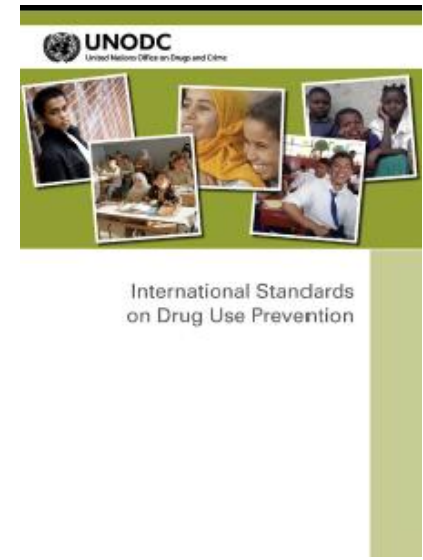
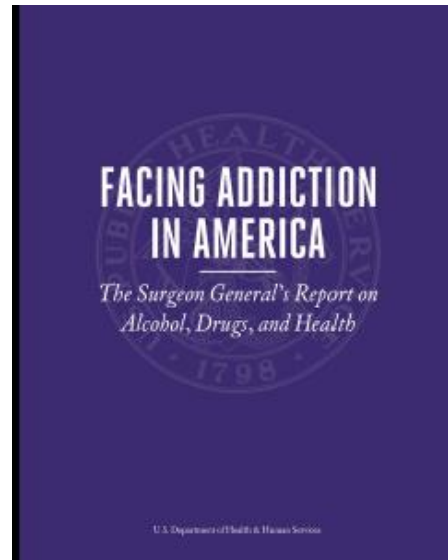
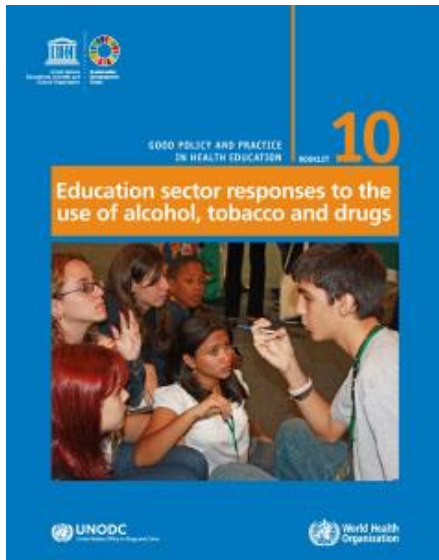
Delayed Initiation of Alcohol Use



Reduction in Suicidal Ideation



Reduced Bullying and Victimization



Genetically Influenced Externalizing and Internalizing Risk Pathways as Novel Prevention Targets

Danielle M. Dick^{1, 2}, Trisha Saunders³, Emily Balcke¹, Morgan N. Driver², Zoe Neale¹,
Jasmin Vassileva⁴, and Joshua M. Langberg¹

Me Time

Learn about your unique personality style
to get the most out of your college
experience.



Personalized
Feedback
Program

Figure 1
Example Personalized Graphical Avatar Accompanied by Risk Profile Across the Four Domains

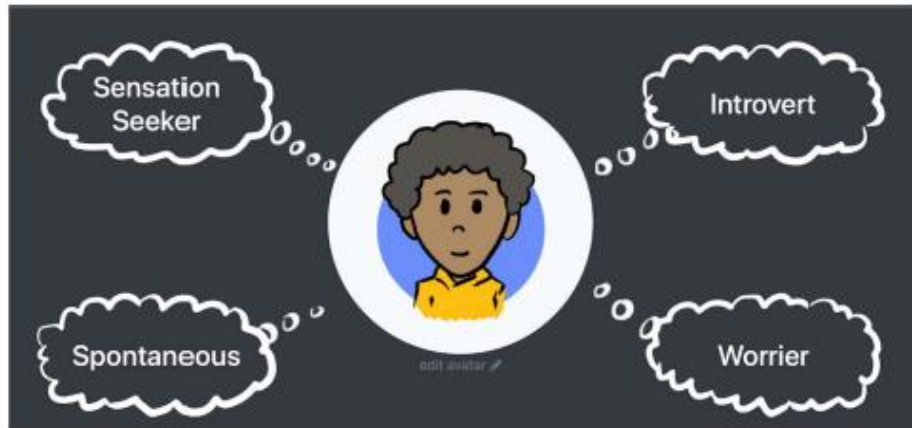


Figure 2
Example Dimensional Presentation of Risk Profiles for the Four Domains



The Good

Sensation-seekers love trying new things. They seek adventure and new experiences. Entrepreneurs and great leaders tend to be higher on risk-taking - as are fighter pilots! Whether you are an occasional rush seeker or a full-on adrenaline lover, you can use your sensation-seeking superpower to take risks to make your dreams happen.

The Not-So-Good

In chasing the fun, sensation-seekers sometimes put themselves in danger. In the college environment, one of the biggest potential challenges for sensation-seekers are *alcohol and drugs* which some sensation-seekers are drawn to, and can interfere with long-term goals.

Level Up!

Try channeling your energy into fun experiences that can satisfy your need for adventure, but that won't interfere with your long-term goals. Keep the fun and reduce the risk of bad things happening.

Here are some options at VCU.

Need to burn off some steam? [VCU Recreational Sports](#) has tons of fun ways to get your sweat on- no matter what you are into, you can find your fit.

Love the outdoors? Check out the [Outdoor Adventure Program](#) through VCU Rec Sports.



CARES

Comprehensive Addiction Risk Evaluation System



Personalized Risk Profiles based on 20+ years research
addictionrisk.com



1



2



3



4

Individual creates account, answers short **survey** about **behavior/environment**



Provides a saliva sample for **genotyping**



Genetic + environmental info combined to give **personalized risk estimates** via mobile.




Evidence-based resources to reduce risk, tailored to personalized risk profile

Part 1

Behavioral/Environmental Survey & Genetic Test

Part 2

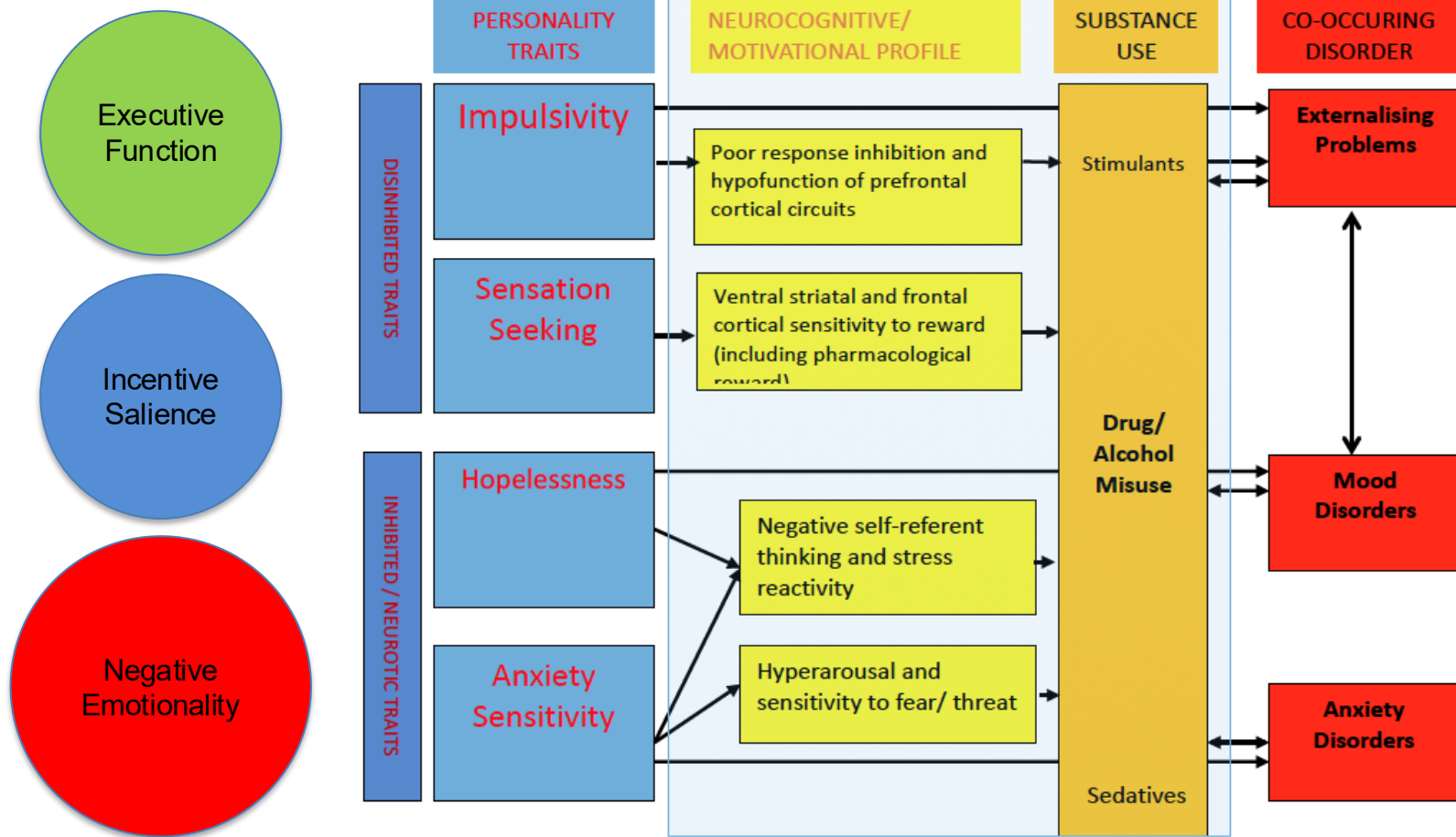
Personalized Resources



Неврокогнитивни Рискови Фактори

Неврокогнитивни корелати на екстернализиращи и интернализиращи личностни рискови фактори

ANA домейни



Impulsivity

```
graph TD; A[Impulsivity] --> B[Trait]; A --> C[State]; B --> D[Personality]; B --> E[Psychiatric]; C --> F[Neurocognitive]; D --- G[General Risk]; E --- G; F --- H[Imminent Risk];
```

Trait

State

Personality

Psychiatric

Neurocognitive

General Risk

Imminent Risk

Neurocognitive Impulsivity

Impulsive **Choice**
Decision Making /
Reward Sensitivity

Delay-related
decision-making

Risk-related
decision-making

“**HOT**”

Impulsive **Action**
Response Inhibition

Impulsive actions

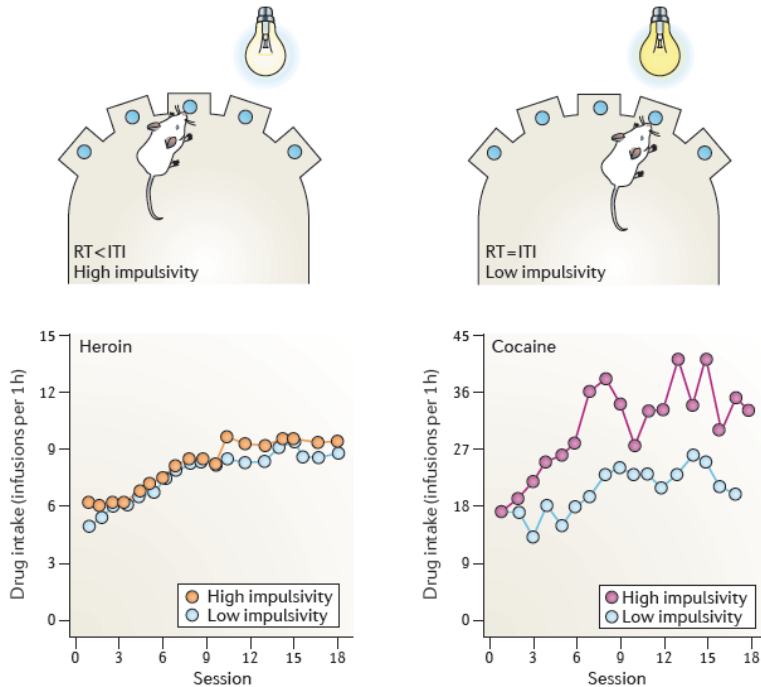
Compulsive actions

“**COOL**”

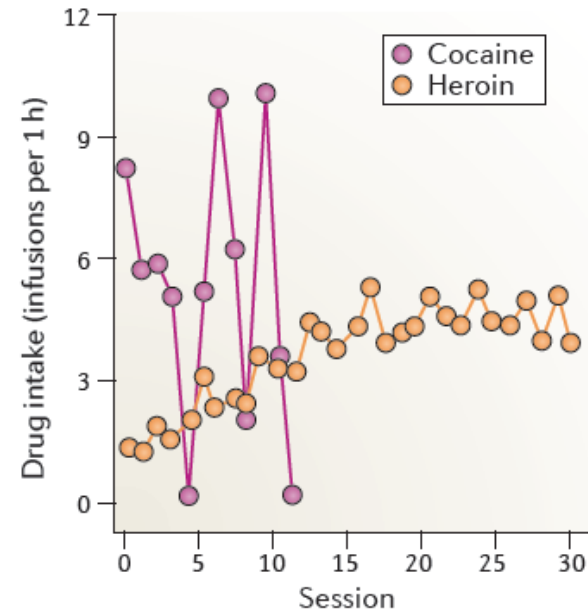
Opiate versus psychostimulant addiction: the differences do matter

Aldo Badiani, David Belin, David Epstein, Donna Calu and Yavin Shaham

c High impulsivity predicts escalation of cocaine intake but not heroin intake



b Self-administration of heroin and cocaine



High trait impulsivity predicts escalation of cocaine but not heroin intake

Unlimited access to cocaine but not heroin causes loss of control over drug intake and death by overdose

Differences between opioids and stimulants

Heterogeneous addictive disorders



- Genetic factors
- Pharmacodynamics
- Neural substrates of reward
- Contextual factors

Polysubstance Problem



**“I drink to forget about my
painkiller addiction.”**

Solution to Polysubstance Use Problem

→ **Bulgaria**

‘Pure’ opiate and
stimulant users

R21DA018086 (2003-2006)

R21DA025417 (2008-2009)

R01DA021421 (2008-2026)

R01DA058038 (2023-2028)



Why Bulgaria?

“Balkan Drug Route” for heroin

Interactive: main trafficking routes into Europe

Balkan route

Southern route

Northern route

Caucasus route



Click on hotspots for more information



Bulgaria – Major Production Center for Amphetamines



LEGEND

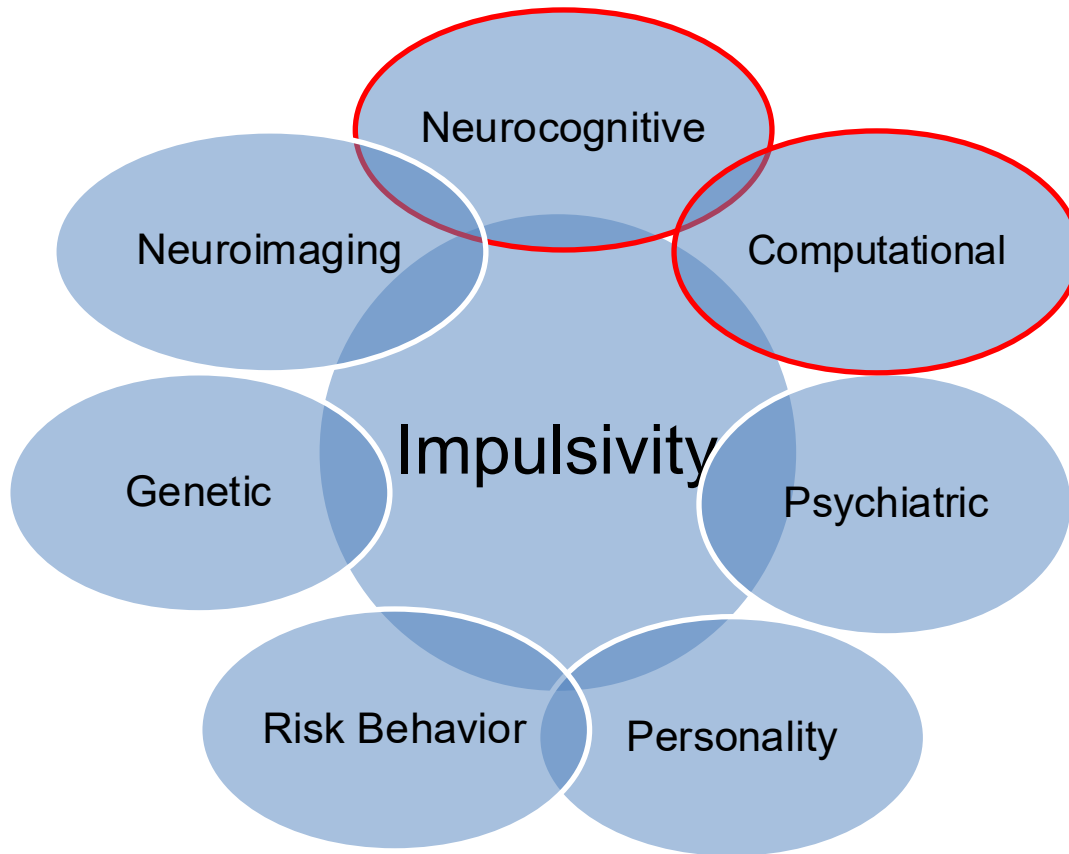
→ Recognized Trafficking Route

- - - - -> Unspecified Trafficking Route



Recognized Manufacturing Source

Multidimensional Assessment



Participants

N=944

260 Controls

173 "pure" heroin

187 "pure" amphetamine

204 polysubstance

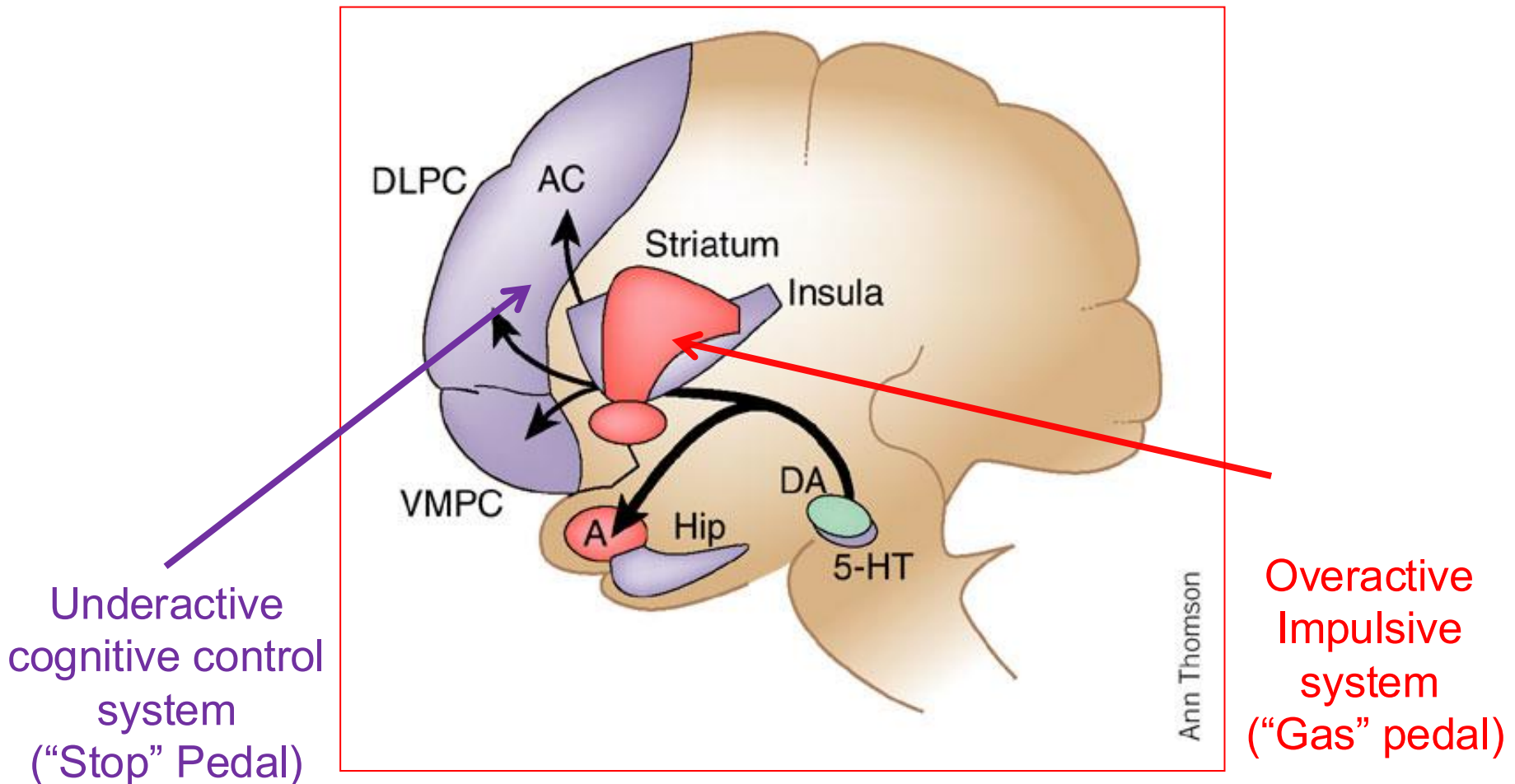
67 siblings / heroin

52 siblings / amphetamine

Deep Phenotyping

Neurocognitive Measures	Personality Measures	Psychiatric Measures	Other Measures
<ul style="list-style-type: none"> •Iowa Gambling Task •Cambridge Gambling Task •Delayed Reward Discounting Task •Balloon Analogue Risk Task •Immediate Memory Task •Stop Signal Task •Go/No-go Task <p><u>Computational</u></p> <ul style="list-style-type: none"> • Reward Sensitivity • Loss Aversion • Learning/memory • Exploitation/exploration 	<ul style="list-style-type: none"> • Barratt Impulsiveness Scale-11 (BIS-11) • UPPS Impulsive Behavior Scale • Sensation Seeking Scale-V (SSS-V) • Buss-Warren Aggression Questionnaire • Levenson's Self-Report Psychopathy Scale (LSRP) 	<p><u>Addictions</u></p> <ul style="list-style-type: none"> •Alcohol Abuse / Dependence (SCID; ASI) •Substance Abuse/ Dependence (SCID; ASI) •Nicotine Dependence (Fagerstrom) •Pathological Gambling (ASI, DSM criteria) <p><u>Externalizing</u></p> <ul style="list-style-type: none"> •ADHD (WURS) •Conduct Disorder (SCID) •Antisocial Personality Disorder (SCID) •Psychopathy (PCL:SV) <p><u>Internalizing</u></p> <p>Beck Depression Inventory-II State-Trait Anxiety Inventory Anxiety Sensitivity IndexToronto Alexithymia Scale</p>	<ul style="list-style-type: none"> • Rapid HIV testing •Alcohol/Drug toxicology screen •Opiate/Stimulant Withdrawal •Family history of psychiatric and substance use disorders (pedigree) •IQ (Raven's) •Handedness <p><u>HIV Risk Behaviors</u></p> <ul style="list-style-type: none"> •HIV Risk Assessment Battery (RAB) •HIV Risk Behavior Scale (HRBS) (30 days and lifetime) •HIV knowledge and condom use scale

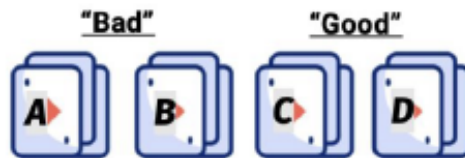
Addiction → Developmental Disorder of Impaired Decision-Making



Neurocognitive Tasks of Decision-Making

Iowa Gambling Task (IGT)

- Choose one of four decks on each trial to maximize payoffs.
- 5 blocks, 100 trials.

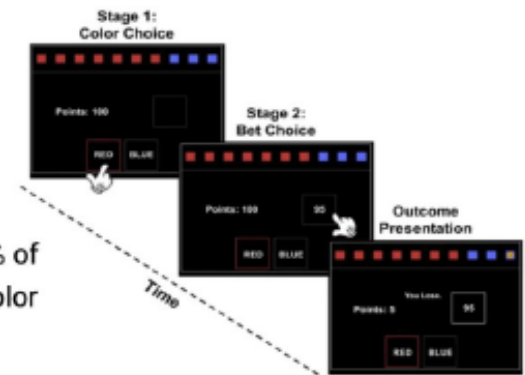


Gain Amount	+100	+100	+50	+50
Loss Amount	-150 to -350	-1250	-25 to -75	-250
Likelihood of Gain	50%	90%	50%	90%
Expected value	-250	-250	+250	+250

Bechara et al. (2001)

Cambridge Gambling Task (CGT)

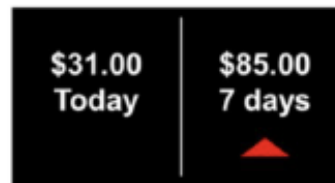
- Choose one of two colors where the token would be hidden.
- Place a bet (5 - 95% of earnings) for the color choice.



Rogers et al. (1999); Romeu et al. (2020)

Delay Discounting Task (DDT)

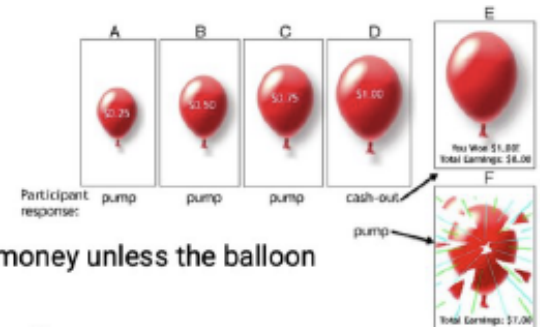
- Choose one of two options; small immediate rewards vs large delayed rewards. 27 trials.
- Reward magnitude
 - Small (\$25-35)
 - Medium (\$50-60)
 - Large (\$75-85)
- Reward delay
 - Today vs Delay (1 week-6 months)



Kirby et al. (1999)

Balloon Analogue Risk Task (BART)

- Incrementally inflate a balloon by clicking a button.
- Each click adds money unless the balloon explodes.
- Maximize the payoff

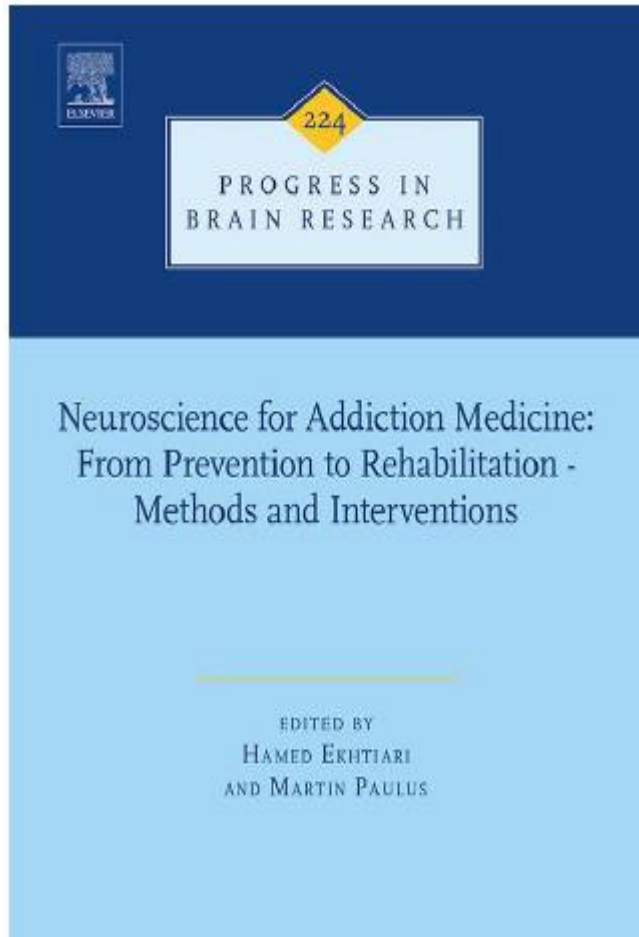


Lejuez et al. (2002); Telzer et al. (2014)

Limitations of Standard Neuropsychological Tasks

- Measure broad cognitive functions
- “Task impurity problem”
- Crude summary statistics
- Atheoretical behavioral metrics
- Poorly understood mechanisms and neurocircuit signatures
- “Reliability paradox” → Replicable group-level effects but low test-retest reliability (i.e., fail to capture individual differences)

Computational Modeling as a Novel Phenotyping Tool



Computational modeling for addiction medicine: From cognitive models to clinical applications

Woo Young Ahn^{*,†}, Junyi Dai[‡], Jasmin Vassileva^{*}, Jerome R. Busemeyer[§]
Julie C. Stout^{¶,1}

Computational Models of Decision-Making Tasks

- Reinforcement learning framework
- Hierarchical Bayesian Analysis: parameter estimation (R package “hBayesDM”).



Ahn et al. (2017)

IGT Outcome-Representation Learning Model

A+	$0 \leq A+ \leq 1$	reward learning rate
A-	$0 \leq A- \leq 1$	punishment learning rate
K	$0 \leq K \leq 5$	perseverance decay
β_F	$-\infty \leq \beta_F \leq +\infty$	outcome frequency weight
β_P	$-\infty \leq \beta_P \leq +\infty$	perseverance weight

Haines et al. (2018)

DDT Hyperbolic Model

k	$0 \leq k \leq 1$	discounting rate
β	$0 \leq \beta \leq 5$	inverse temperature

Mazur. (1987)

CGT Cumulative Model

α	$0 \leq \alpha \leq 5$	probability distortion
ρ	$0 \leq \rho \leq +\infty$	relative loss sensitivity
c	$0 \leq c \leq 1$	color bias
β	$0 \leq \beta \leq +\infty$	discounting rate
γ	$0 \leq \gamma \leq +\infty$	choice sensitivity

Romeu et al. (2020)

BART Exponential-Weight Mean-Variance Model

φ	$0 \leq \varphi \leq 1$	prior belief of burst
η	$0 \leq \eta \leq 1$	updating exponent
ρ	$-0.5 \leq \rho \leq +0.5$	risk preference
τ	$0 \leq \tau \leq +\infty$	inverse temperature
λ	$0 \leq \lambda \leq +\infty$	loss aversion

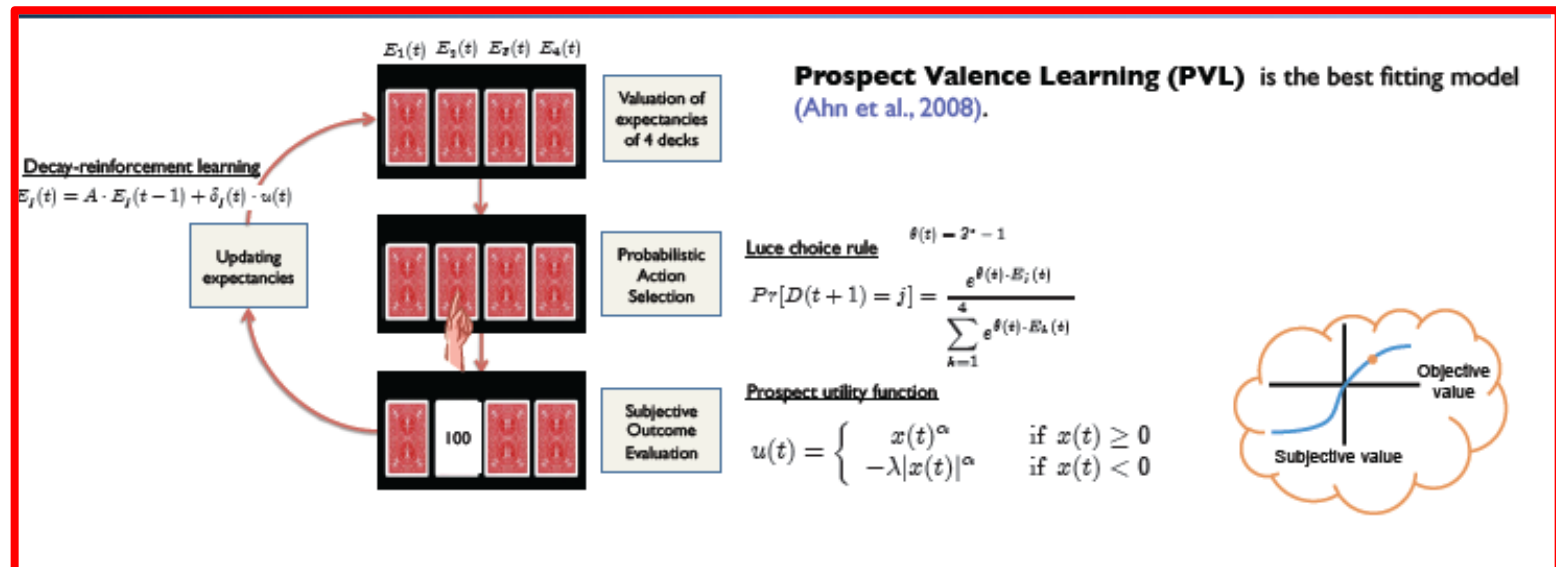
Park et al. (2021)

Open-source codes for computational models:
<https://github.com/CCS-Lab/hBayesDM>
 (hierarchical Bayesian modeling of Decision-Making tasks)



Decision-making in stimulant and opiate addicts in protracted abstinence: evidence from computational modeling with pure users

Woo-Young Ahn¹, Georgi Vasilev², Sung-Ha Lee³, Jerome R. Busemeyer³, John K. Kruschke³, Antoine Bechara^{4,5} and Jasmin Vassileva^{6*}



Four parameters that reflect distinct psychological processes:

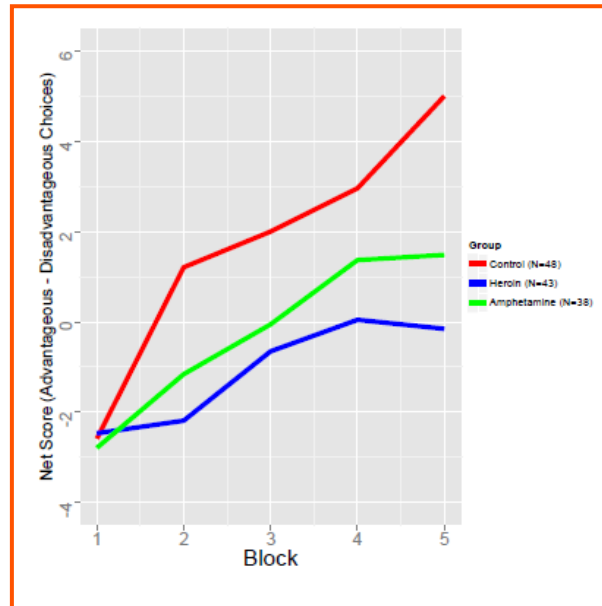
A: learning rate (**High A**: good learning/memory, **low A**: rapid memory decay)

α : utility shape parameter (**High α** : high reward sensitivity, **low α** : low reward sensitivity)

c: exploration/exploitation parameter (**High c**: high adherence to their expectancies, **low c**: random choice)

λ : loss aversion (**High λ** : high loss aversion, **low λ** : low loss aversion)

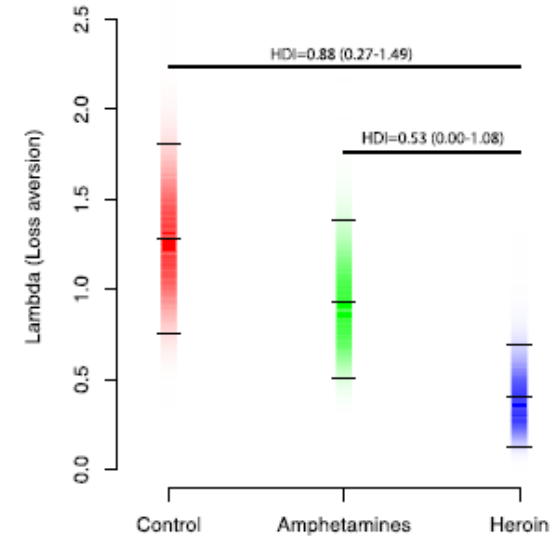
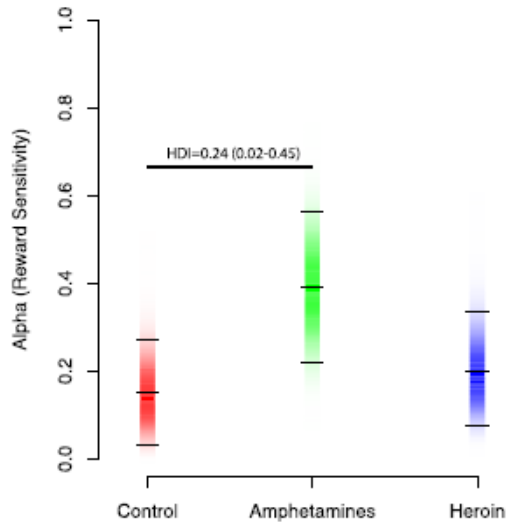
Behavioral Results



↑ Stimulants:
Reward Sensitivity

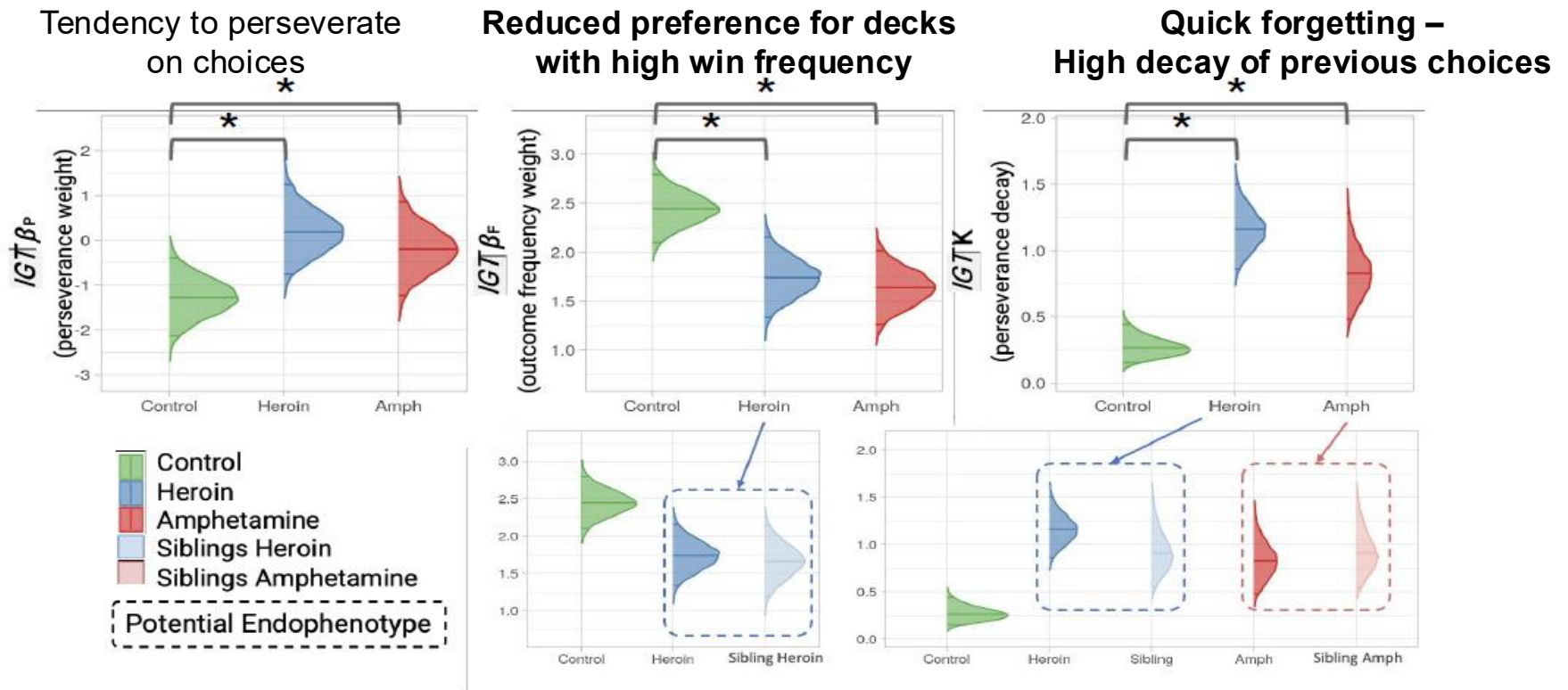
↓ Opiates:
Loss Aversion

Computational Modeling Results



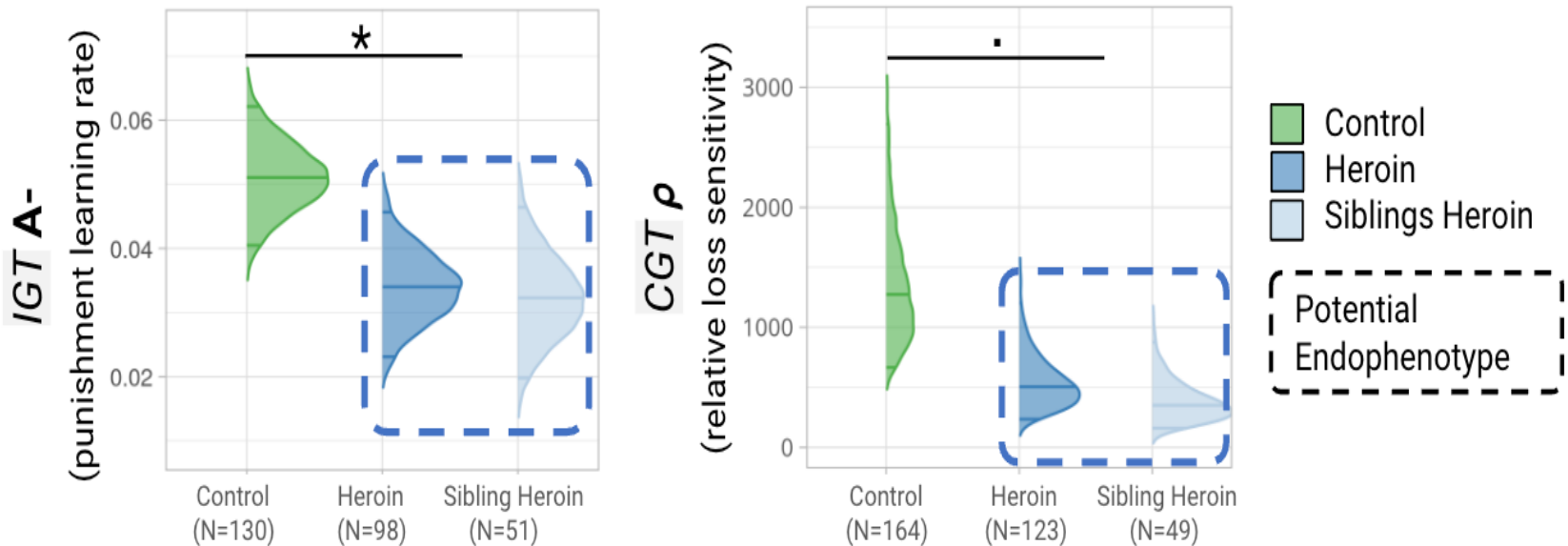
Computational Parameter Estimates as Candidate Endophenotypes of Addiction

Common to both opiate and stimulant users (and their siblings)
→ Potential **endophenotypes for addiction in general**



Reduced sensitivity to loss (loss aversion): Unique to Opioid users and their siblings

→ Potential endophenotype specific to
opioids

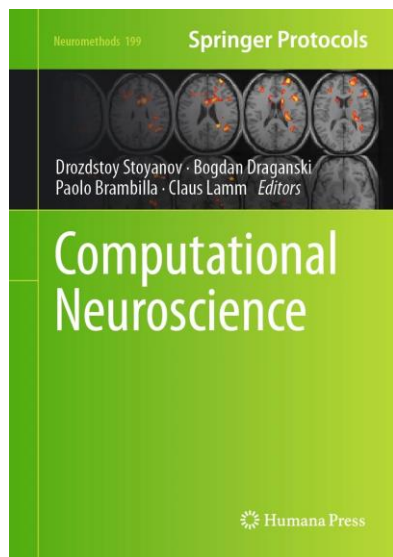




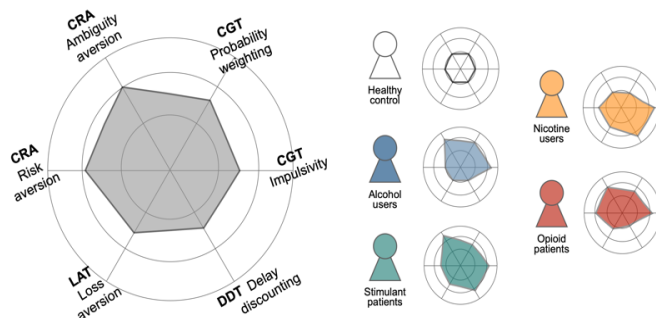
Chapter 14

Utility of Computational Approaches for Precision Psychiatry: Applications to Substance Use Disorders

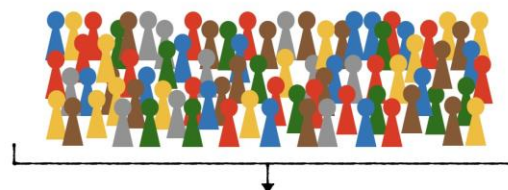
Jasmin Vassileva, Jeung-Hyun Lee, Elena Psederska, and Woo-Young Ahn



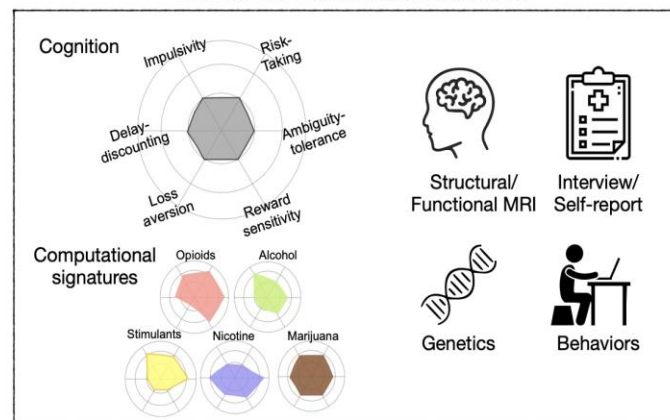
Computational signatures of different SUDs



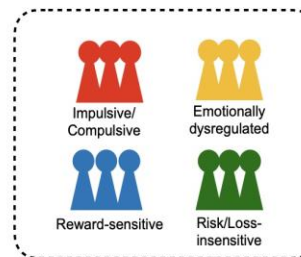
Heterogeneous addictive disorders



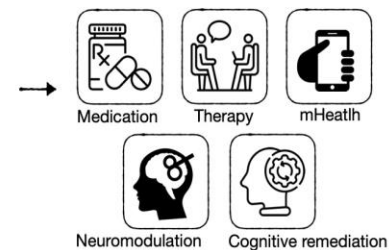
Multi-modal Assessment



Neurocomputational biotypes



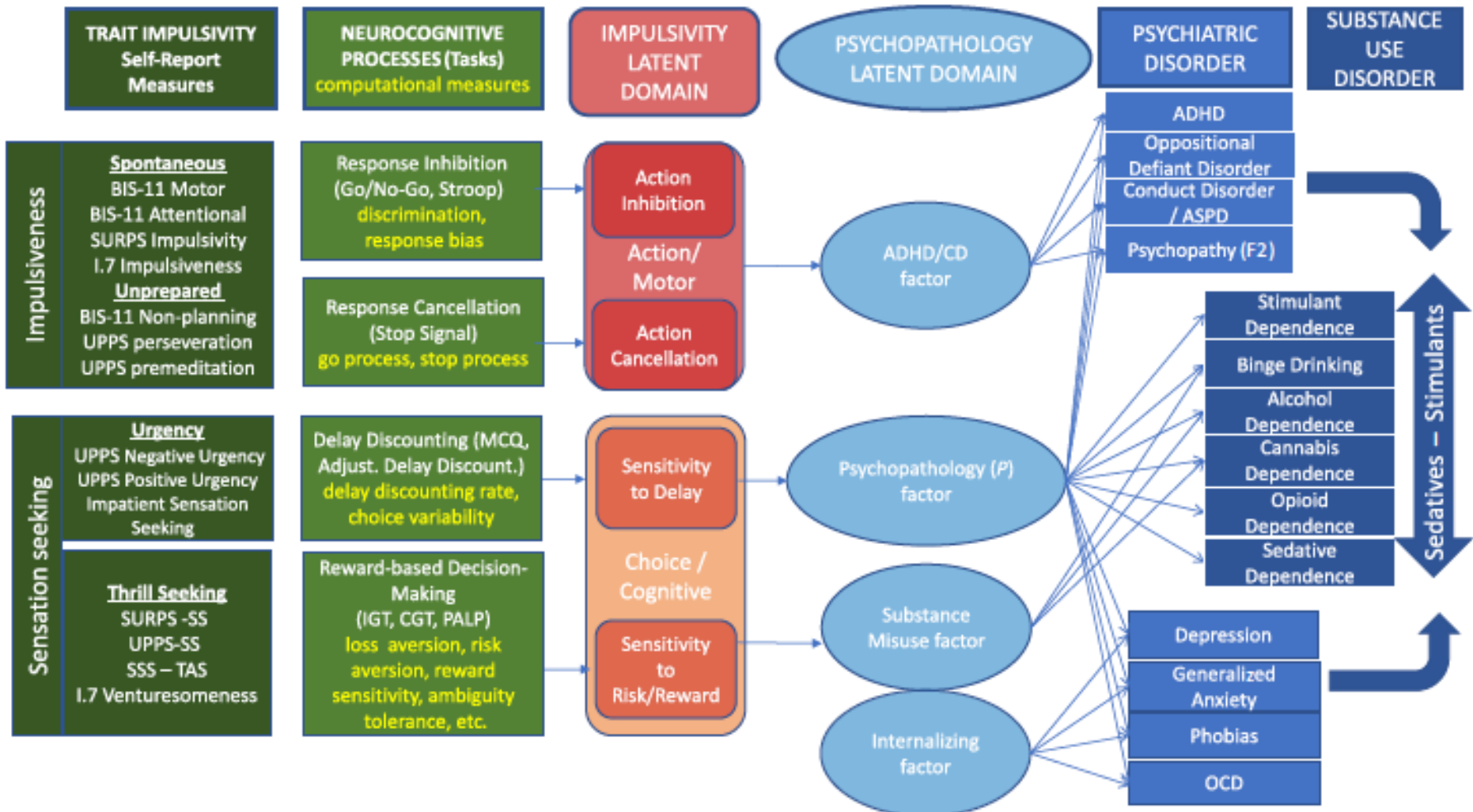
Personalized interventions





Impulsivities and addictions: a multidimensional integrative framework informing assessment and interventions for substance use disorders

Jasmin Vassileva^{1,2} and Patricia J. Conrod^{3,4}



Psychoeducational Approaches for Substance Use Prevention



Neuroscience-based Psychoeducational Approaches

Neuroscience-informed psychoeducation for addiction medicine: A neurocognitive perspective

Hamed Ekhtiari^{*,†,1}, Tara Rezapour^{†,‡}, Robin L. Aupperle^{*,§}, Martin P. Paulus^{*}

Chapter 3
Enhancing Cognitive Resilience in Adolescence and Young Adults: A Multidimensional Approach

Tara Rezapour, Shervin Assari, Namik Kirlic, Jasmin Vassileva, and Hamed Ekhtiari

Am J Drug Alcohol Abuse. 2021 January 02; 47(1): 16–25. doi:10.1080/00952990.2020.1770777.

Piloting of the Just Say Know Prevention Program: A Psychoeducational Approach to Translating the Neuroscience of Addiction to Youth

Lindsay R. Meredith^a, Anna M. Maralit^b, Suzanne E. Thomas Salazar^b, Raymond F. Anton^b, Rachel L. Tomko^b, Lindsay M.

^a Department of Psychology, University of California, Los Angeles

^b Department of Psychiatry and Behavioral Sciences, Medical University of Charleston, SC, USA

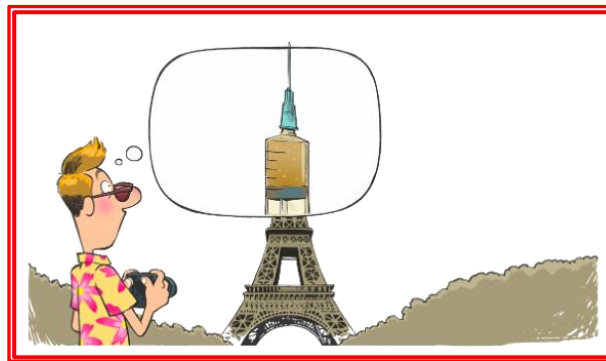


Neuroscience-informed classification of prevention interventions in substance use disorders: An RDoC-based approach

Tara Rezapour^a, Parnian Rafei^c, Alex Baldacchino^d, Patricia J. Conrod^e, Geert Dom^f, Diana H. Fishbein^{g,h}, Atefeh Kazemi^a, Vincent Hendriks^{i,j}, Nicola Newton^k, Nathaniel R. Riggs^l, Lindsay M. Squeglia^m, Maree Teesson^k, Jasmin Vassilevaⁿ, Antonio Verdejo-Garcia^o, Hamed Ekhtiari^{b,*}

Utility of Cartoons for Psychoeducation: Neurocognitive Perspective

- Grab attention
- Facilitate memory
- Enhance self-awareness
- Time travel
- Cognitive reappraisal tool
- Reduce stigma





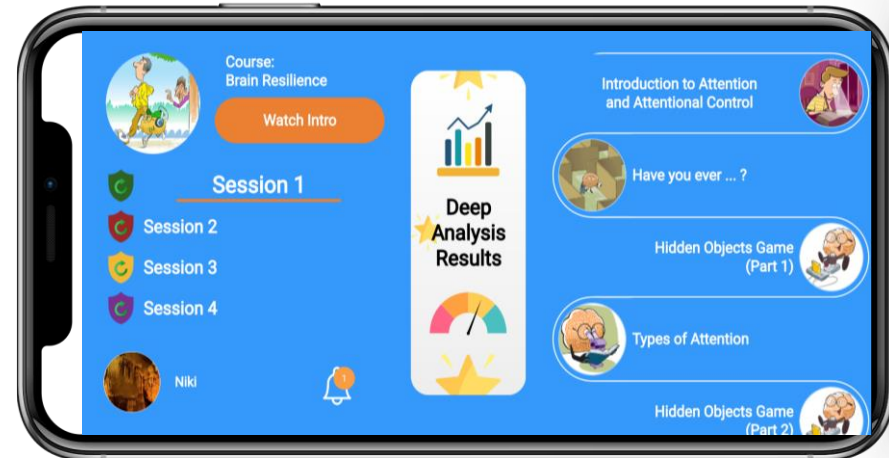
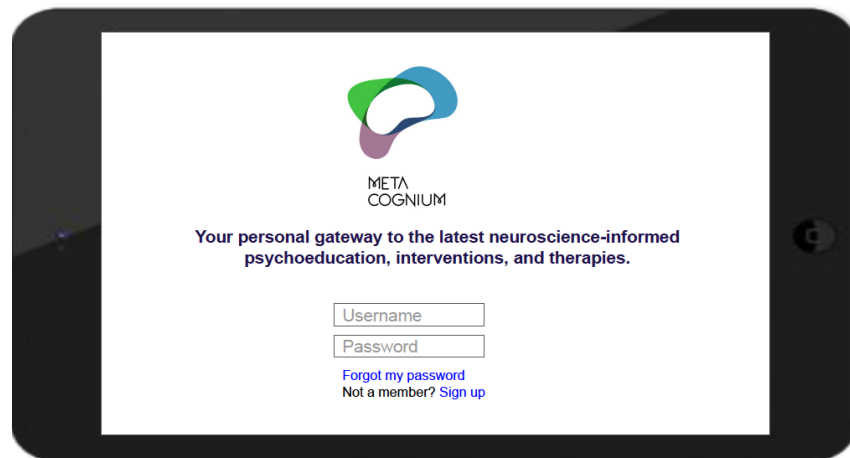
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EDITED BY
Catalina Lopez-Quintero,
University of Florida, United States

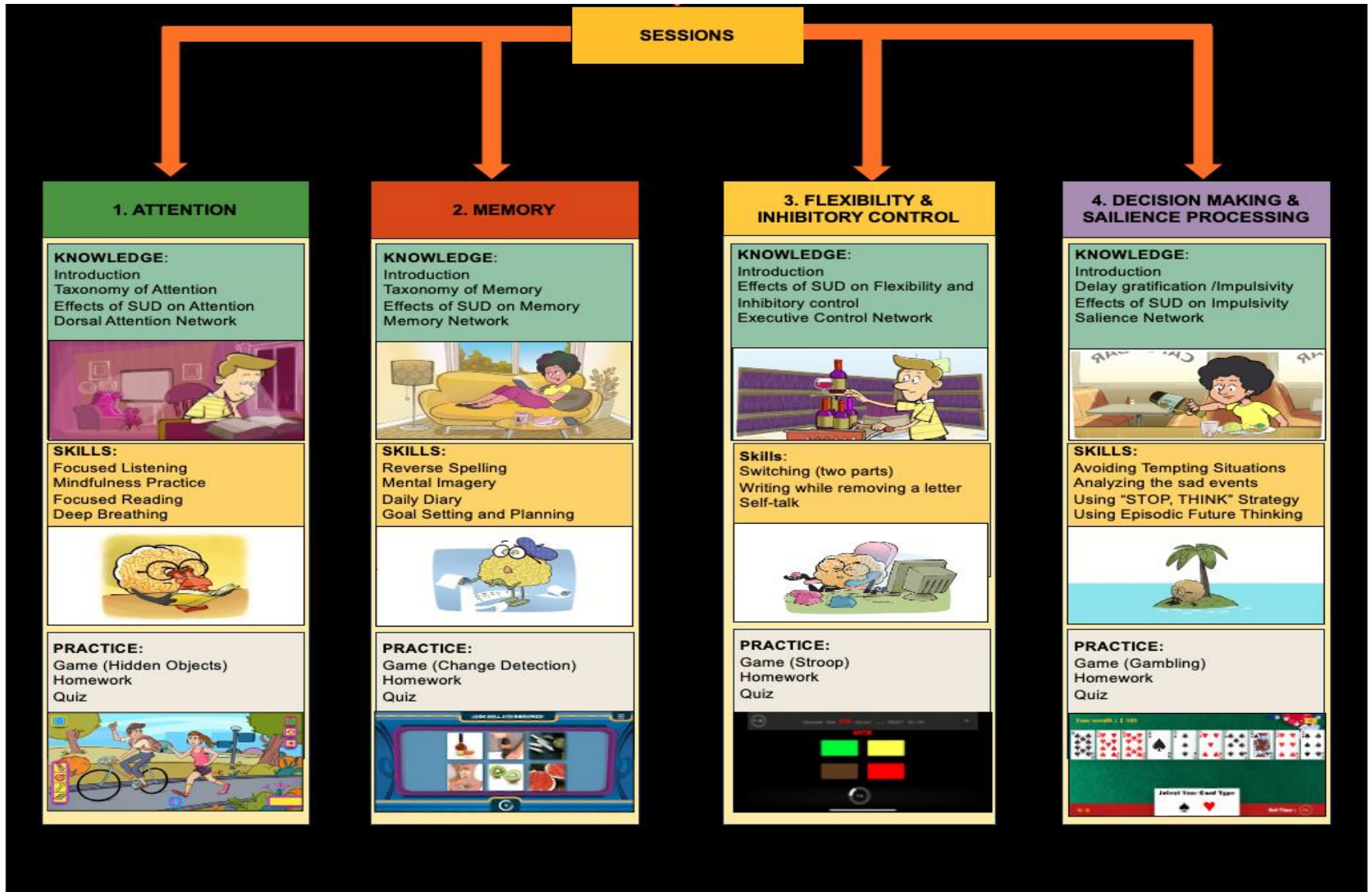
REVIEWED BY
Ji-An Li,
University of California, San Diego,
United States
Diana Fishbein,

Neuroscience-informed psychoeducation for addiction: a conceptual and feasibility study

Tara Rezapour^{1,2}, Kayla L. McLean¹, Elena Psederska³,
Khashayar Niki Maleki⁴, Hamed Ekhtiari⁵
and Jasmin Vassileva^{1,6*}



NIPA at a Glance




Structure of Sessions






Personal Evaluation Questionnaires

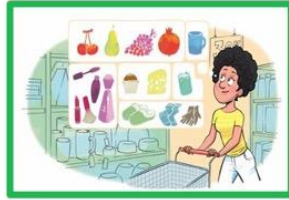
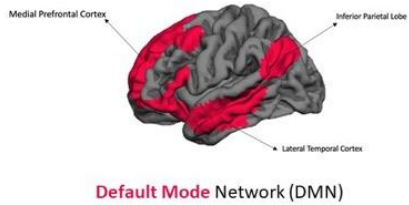
Have you found it difficult to concentrate on activities like reading books or listening to a conversation because of irrelevant thoughts coming into your mind?



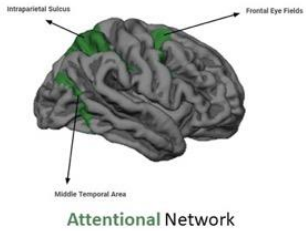
Almost Never Rarely Sometimes Often Almost Always

 [Next](#)

Knowledge: RDoC Framework Based on Four Brain Networks

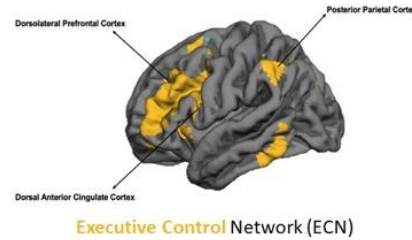


Memory

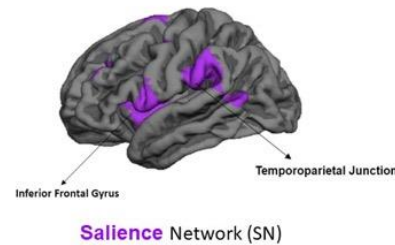


Attention

Cognitive Flexibility/Inhibitory Control

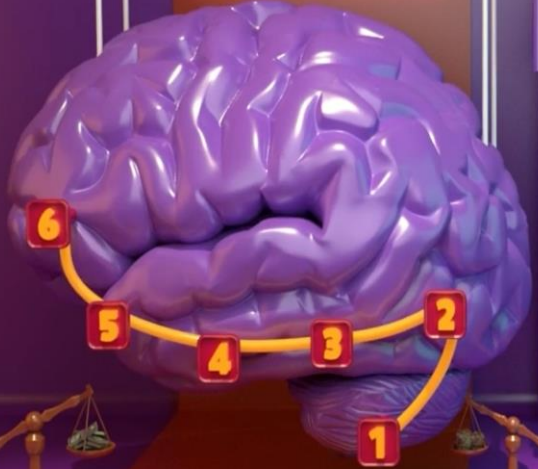


Decision-Making/Incentive Salience



Decision Making & Impulse Control

Brain Networks



Next

Practice / Games

Session1 (Attention)



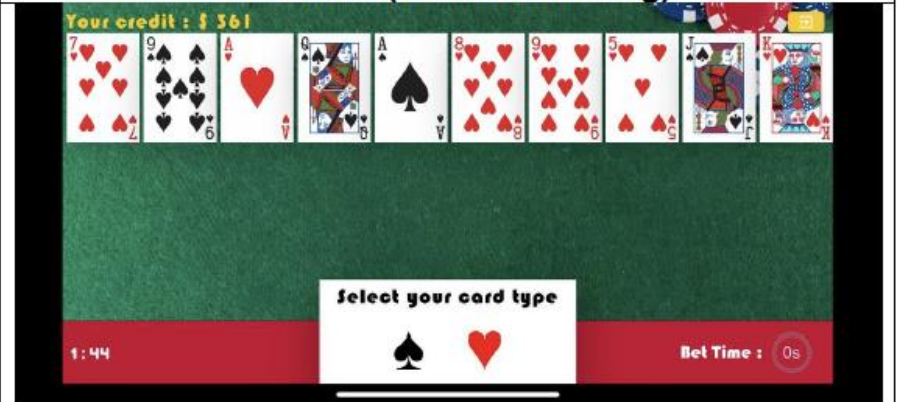
Session 2 (Memory)

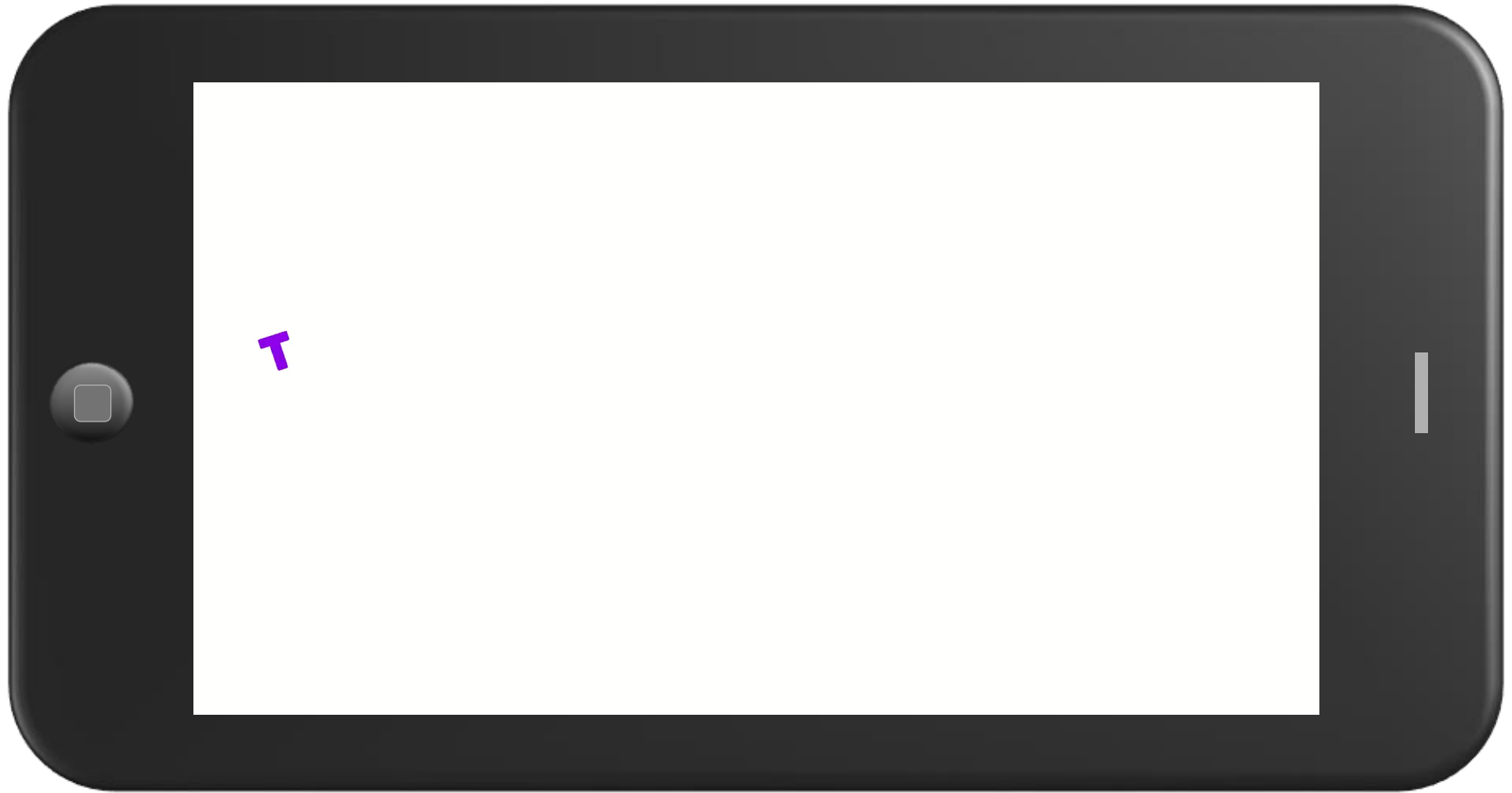


Session 3 (Inhibition)



Session 4 (Decision-Making)





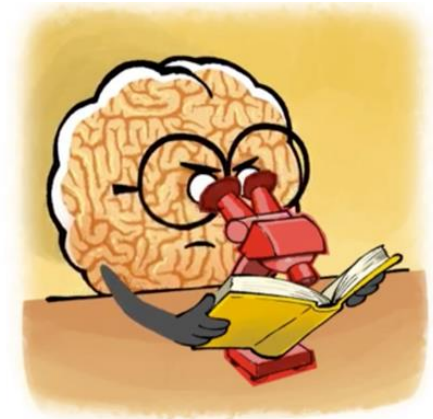
T

Skills Development

Attention



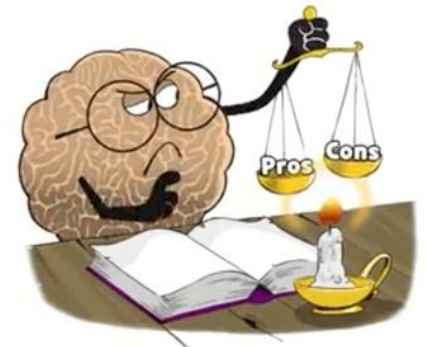
Memory



Flexibility / Inhibitory Control



Decision Making



Personalized Feedback

Sessions

Session One
(Attention)

Session Two
(Memory)

Session Three
(Inhibition)

Session Four
(Decision Making)



Multiple choice questions

Multiple Choice Questions

Games

Quizzes



Score : 45

The closer toward red, the more you need to train your Brain's attention.

Games

Multiple Choice Questions

Games

Quizzes



Title : Hidden Object Identification

Cognitive Focus : Attention

Level	Objects	Score	Stars	Wrong Clicks	Time out
Level 1	4	232	3	0	0
Level 2	6	250	3	1	0
Level 3	7	258	4	0	0
Level 4	8	301	5	2	0

** ODT = Object Detect Time

Quiz

Multiple Choice Questions

Games

Quizzes



Question	Status	Response Time (s)
Question 1	✓	1
Question 2	✗	1
Question 3	✓	1
Question 4	✗	2

Total

Score : 2 / 4

Time : 5 (s)



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EDITED BY
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University of Florida, United States

REVIEWED BY
Ji-An Li,
University of California, San Diego,
United States
Diana Fishbein,

Neuroscience-informed psychoeducation for addiction: a conceptual and feasibility study

Tara Rezapour^{1,2}, Kayla L. McLean¹, Elena Psederska³,
Khashayar Niki Maleki⁴, Hamed Ekhtiari⁵
and Jasmin Vassileva^{1,6*}

SCAN ME



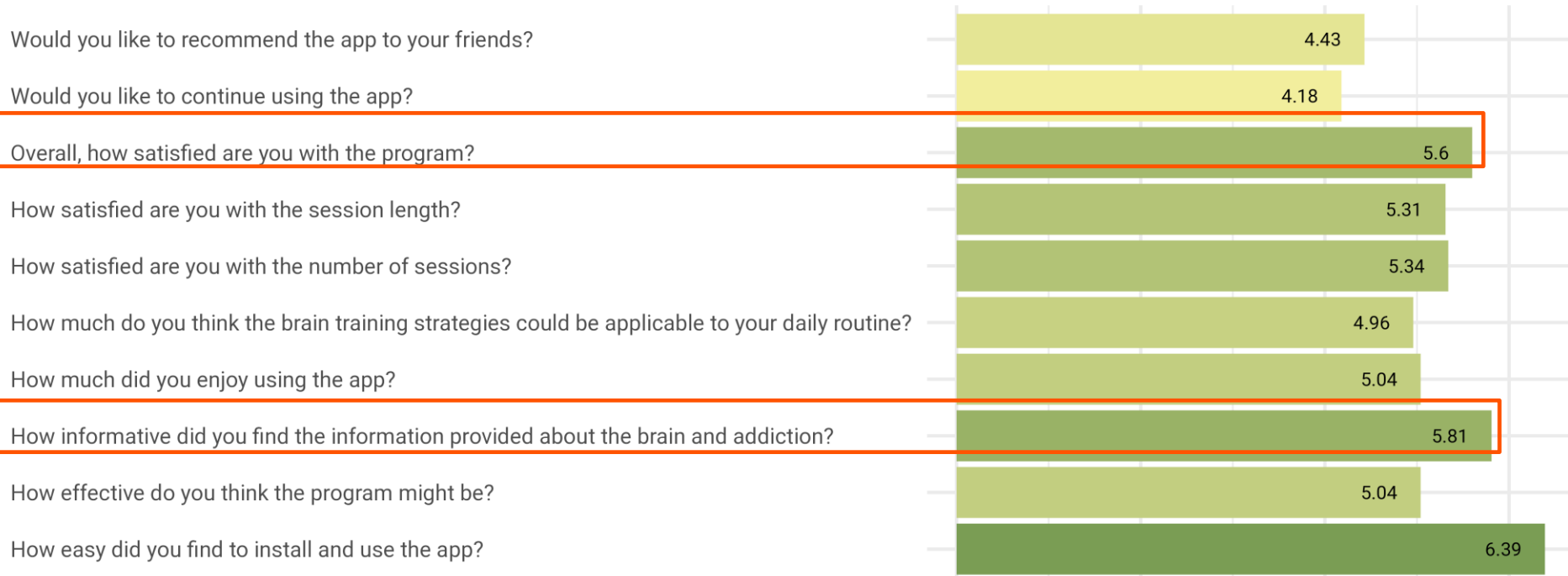
- College students at Virginia Commonwealth University (VCU)
- Three parts of the study:
 - (1) Pre-intervention assessment: N=85
 - (2) Intervention
 - a) Session 1: N=72
 - b) Session 2: N=71
 - c) Session 3: N=69
 - d) Session 4: N=68
 - (3) Post-intervention assessment: N=68
- Online administration

Study Design

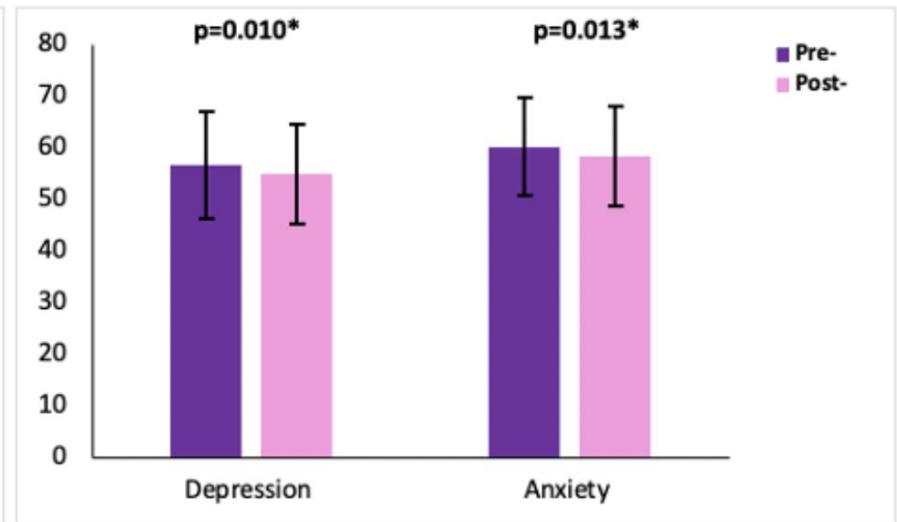
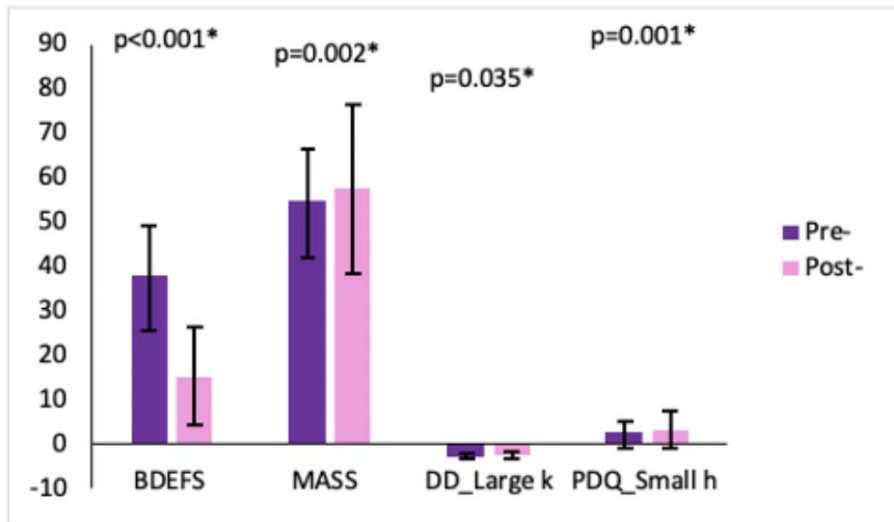
Study design including screening, intervention, and acceptability assessments; The cognitive resilience modules of NIPI intervention, including cognitive mechanisms, knowledge, skills, and practice designed in 4 domains and distributed in 4 sessions.



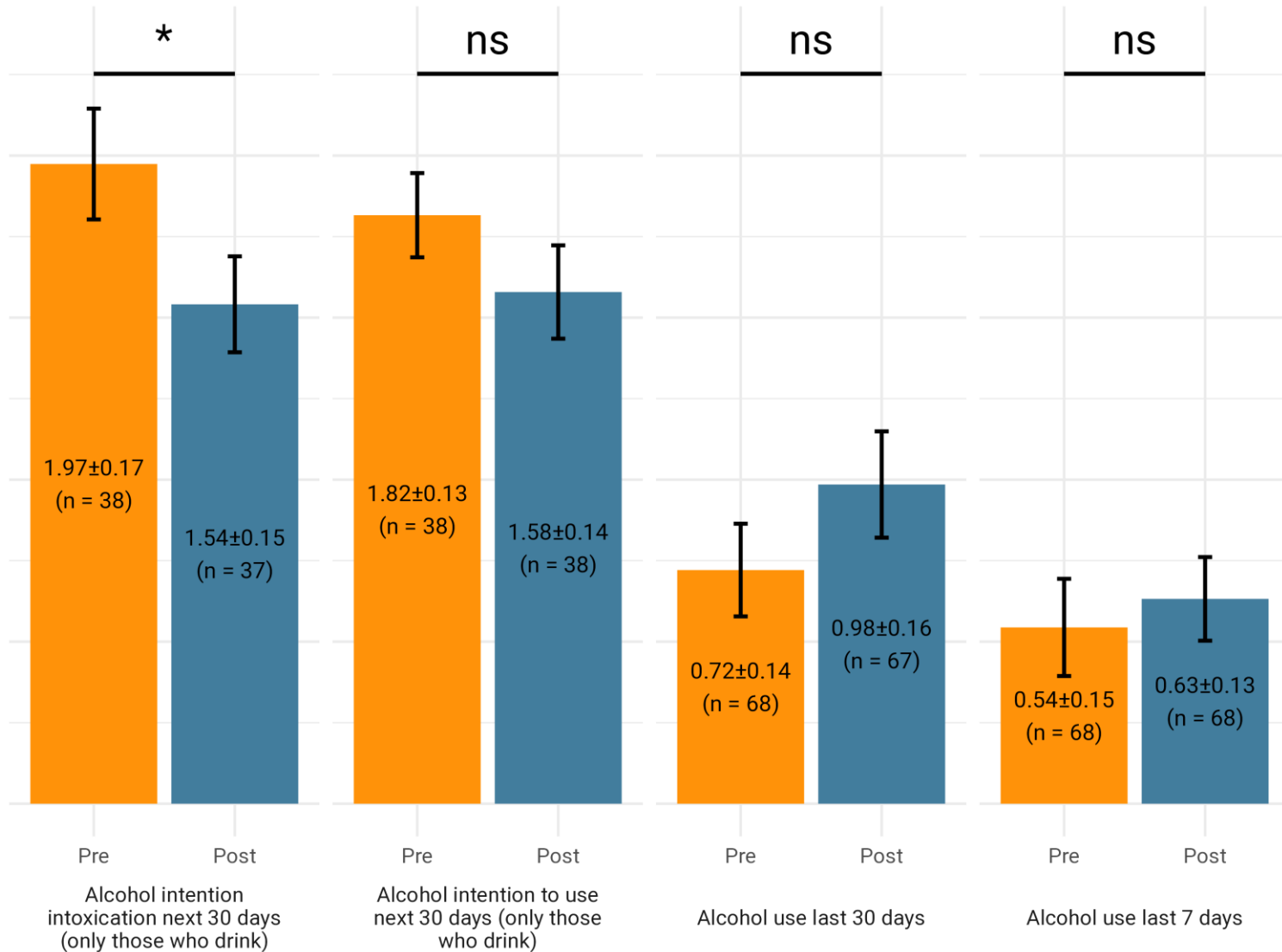
Pilot Feasibility and Acceptability Results: Feedback about the App



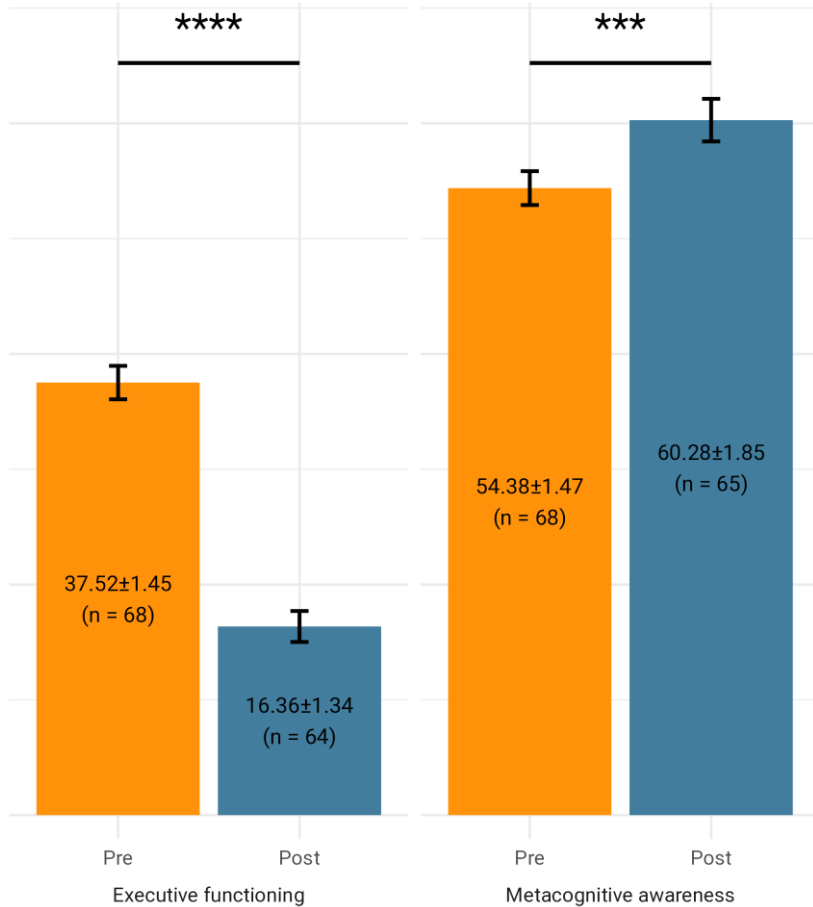
Pre- and Post-Intervention Results



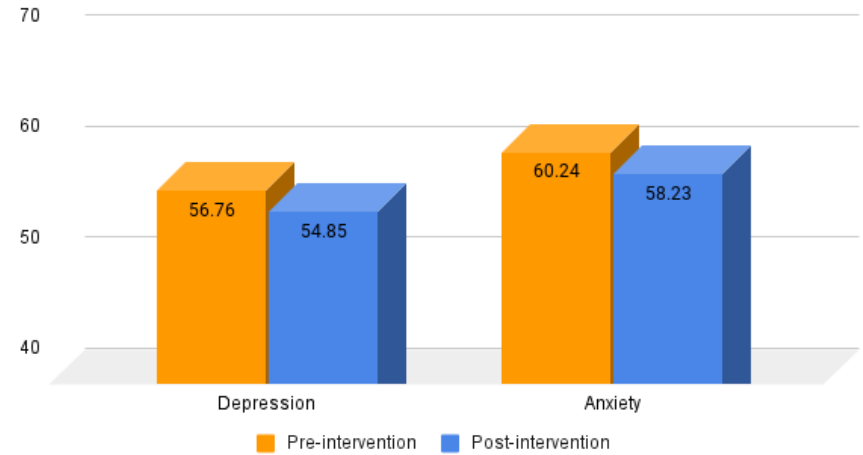
Pre- and Post-Intervention Results



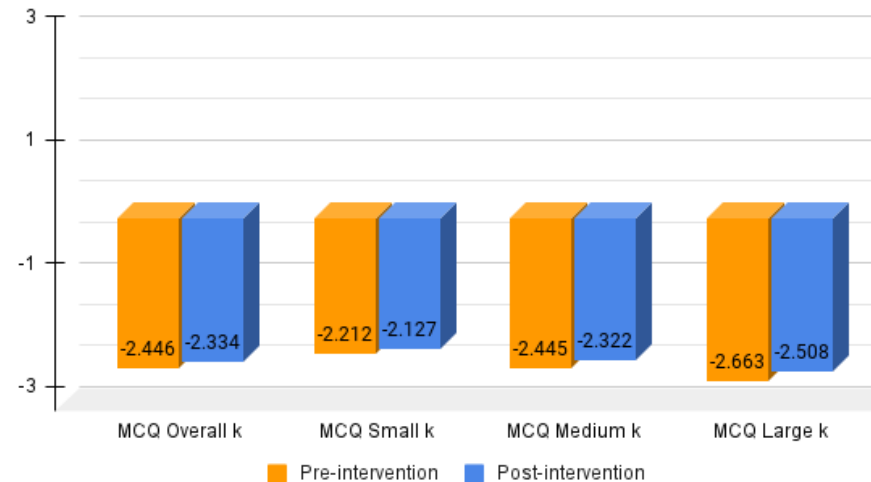
Pre- and Post-Intervention Results



Pre- and Post-Intervention Depression and Anxiety Levels



Pre- and Post-intervention Delay Discounting Rates



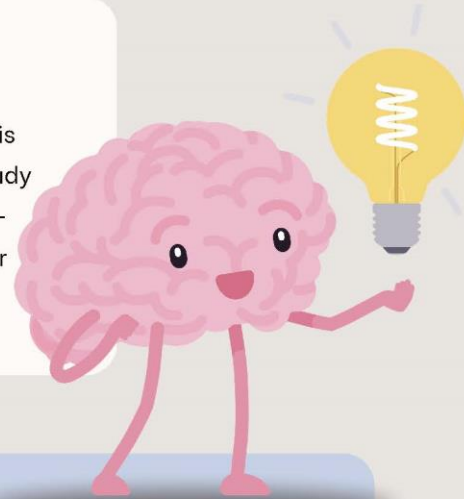
Conclusions

- Neuroscience-informed frameworks are helpful to translate neuroscience findings to prevention interventions.
- Results hold promise for the efficacy of neuroscience-based psychoeducational programs for reshaping substance use intentions, attitudes, and behaviors.
- Using the “seductive allure of neuroscience” may be a more persuasive way to educate participants about the harms of substance use.
- Integrating neuroscience-based psychoeducation with gamified trainings could engage users more than traditional psychoeducational approaches.

INTERESTED IN PARTICIPATING IN A RESEARCH STUDY?

JOIN METACOGNIUM

NBU Department of Cognitive Science is looking for participants in an online study testing Metacognium: a Neuroscience-Informed Psychoeducation Program for college students



WHY PARTICIPATE?

Experience

Learn about your brain and behavior through interactive videos, games, and activities

Compensation

You can receive up to 16 credits for participation!

Inclusion

You must be English-speaking and have smartphone access

**ENROLL
HERE**

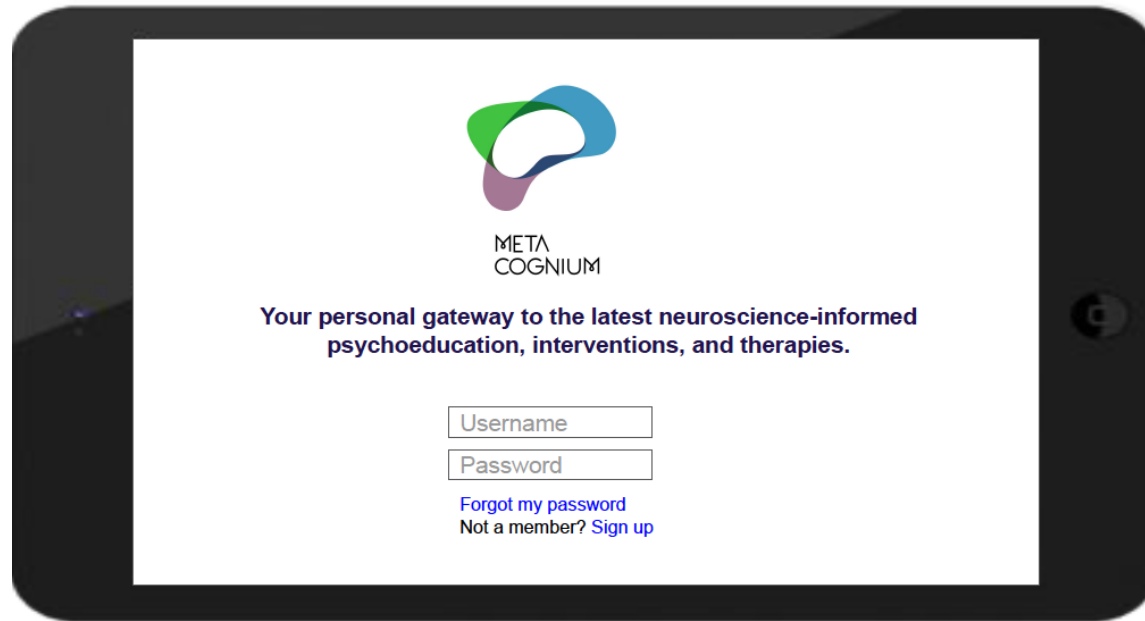
[tinyurl.com/
metacognium](https://tinyurl.com/metacognium)



CONTACT US

metacognium.bg@gmail.com

Would you like to try out the program?



- You can download the **Metacognium app** from **Google Play** or **App Store**
- **Registration ID: ibh01x202**
- **Free trial license until May 4, 2026**

Thank you!

Jasmin.Vassileva@vcuhealth.org