

Addictions Neuroclinical Assessment: A Dimensional Approach to Addiction

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Overview

- Background
- ANA: Definition, Goals
- ANA Implementation
- Next Steps

Background

What is the Addictions Neuroclinical Assessment (ANA)?

- Group of assessments grounded in three neuroscience domains relevant for addiction:
 - Incentive Salience
 - Negative Emotionality
 - Executive Function
- Measures include self-report, behavioral, and neuroimaging
- Ancillary assessments (genetic, use patterns, H&P, environmental and personality measures)

So What?

- Alcohol and substance use disorders are heterogeneous
- Effective treatment options are limited, in part due to heterogeneity
- Prior attempts to identify clinically meaningful subtypes of addicted individuals have not been translated to clinical practice
- We need a practical, clinically-relevant way to better understand this heterogeneity
- ANA as a starting point for developing that understanding

Prior Classification Attempts

Past attempts to group alcoholics into clinically meaningful clusters:

- Cloninger (1988): Type 1 vs. Type 2
- Babor (1992): Type A vs. Type B
- Buchholz (1996): Four classes along a severity continuum
- Moss (2007): Five classes (or three?)

- Review of typologies (Leggio et al., 2009, *Neuropsychology Review*)

Similar efforts in other SUD

Minimal translation to practice

Heavy reliance on drug-related variables

RDoC and AARDoC

In 2009, NIMH launched Research Domain Criteria (RDoC) initiative

- RDoC conceptualized as paradigm shift for classification of mental disorders
- Uses biological and behavioral data
- Serves as a research framework

In 2014, George Koob, NIAAA director, announced plans for an RDoC-like initiative at NIAAA

This announcement was followed by a publication describing an Alcohol Addictions RDoC (AARDoC)

AARDoC and ANA

As described (Litten et al., 2015, *ACER*), Alcohol Addiction RDoC would:

- Serve as a framework for better understanding heterogeneity within AUD diagnosis
- Be based on addiction cycle
- Use advances in understanding the neuroscience of addiction to better understand heterogeneity of SUD

ANA as practical starting point for AARDoC

ANA: What is it?

ANA Domains

Incentive salience

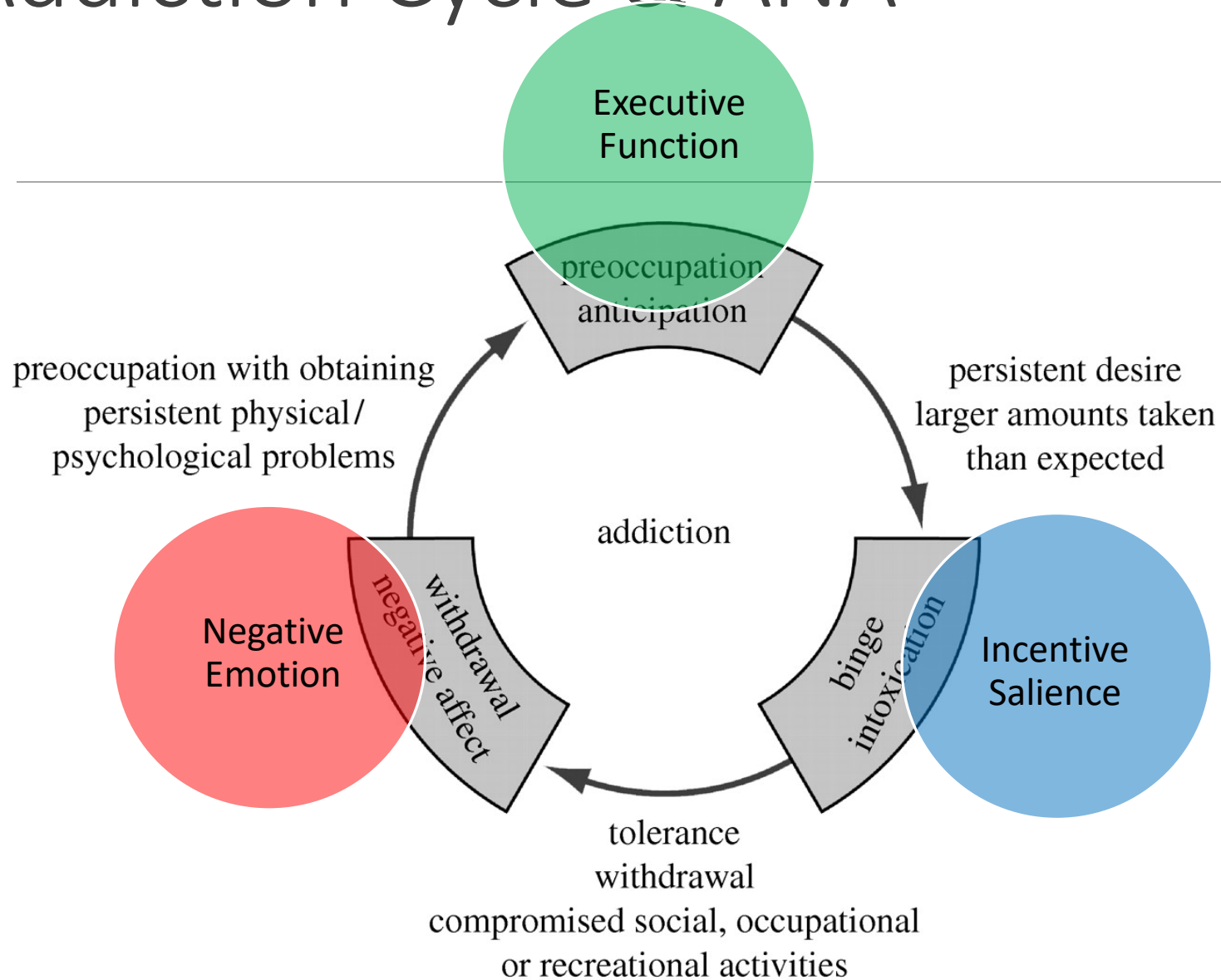
Negative emotionality (surfeit) & reward (deficit)

Executive function

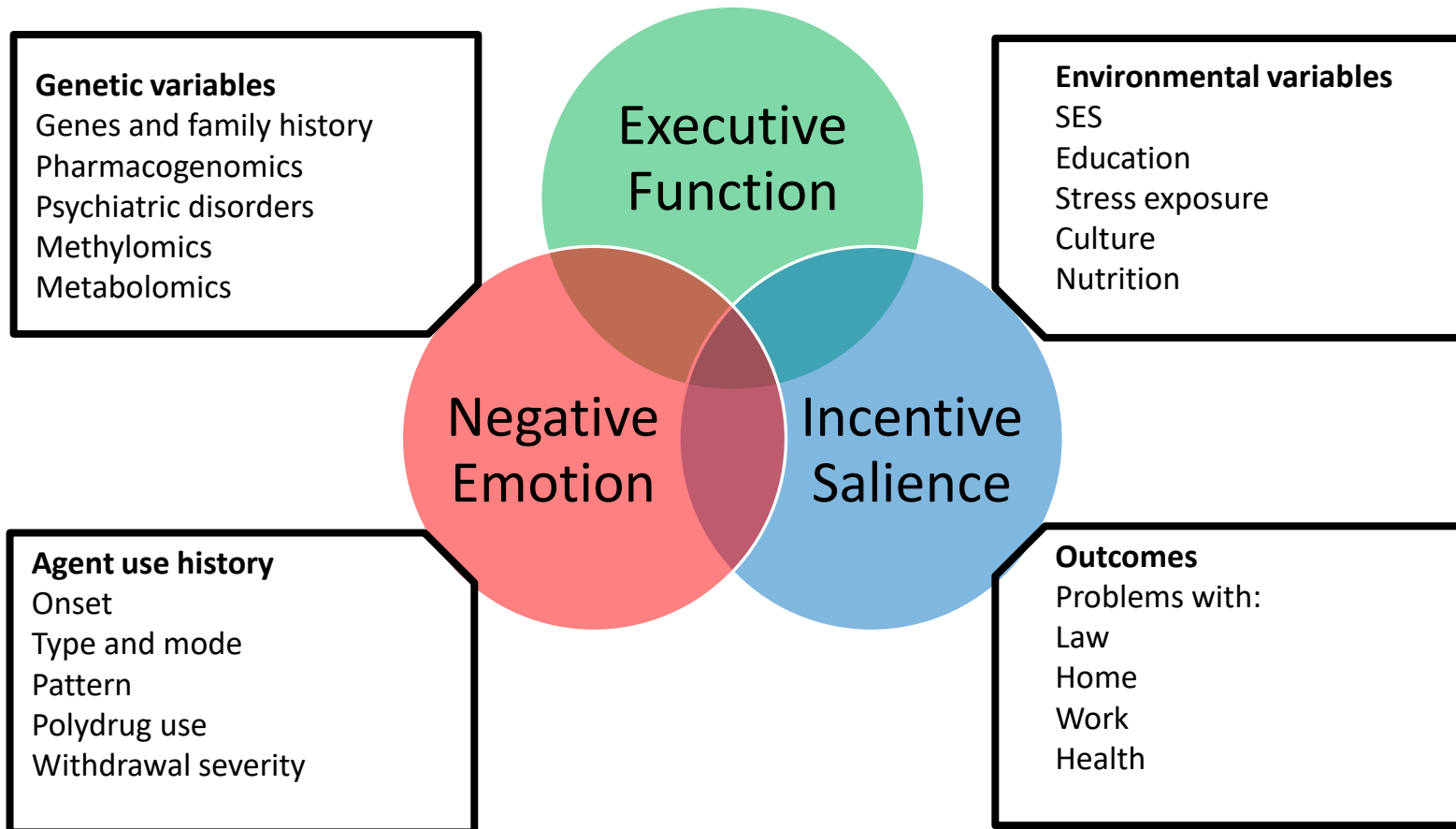
Addictive disorders comprise disruptions in these three domains

Kwako et al., 2016, *Biological Psychiatry*

Addiction Cycle & ANA



ANA Domains and Ancillary Measures



What is ANA? (in practice)

- Group of assessments grounded in three neuroscience domains relevant for addiction:
 - Incentive Saliency
 - Negative Emotionality
 - Executive Function
- Measures include self-report, behavioral, and neuroimaging
- Ancillary assessments (genetic, use patterns, H&P, environmental and personality measures)

Goals of ANA

- Use data collected to identify clinically meaningful subtypes of addictive disorders
- Create a standardized assessment package
- *Disseminate assessment package to various clinical settings*
- *Identify individualized treatments*

ANA

Implementation

CONSTRUCTS AND TASKS

ANA and NIAAA IRP

Currently being collected within the NIAAA IRP, via Screening and Natural History Protocol (SNHP):

- Neuroimaging measures including resting state, DTI, and brain volumes, as well as task-based fMRI
- Varied phenotypic data: psychiatric diagnoses/comorbidities, details about age of onset and drinking histories, response to experimental medications, personality measures (NEO, impulsivity, aggression)
- Blood for genetic processing

SNHP Factor Analysis Project

- Used existing SNHP measures that align with proposed ANA domains
- Participants included 454 individuals, data collected between 2014-2017
- Exploratory and Confirmatory Factor Analysis yielded a three-factor solution:
 - Incentive Salience
 - Negative Emotionality
 - Executive Function (Executive Control)
- Results suggest that the proposed ANA domains fit well with existing data

ANA Battery

- **Deep phenotypic assessment (including behavioral and self-report measures)**
- Structural neuroimaging (whole brain VBM; diffusion tensor imaging)
- Functional neuroimaging tasks and rsFC
- Blood for genetic/genomic analysis
- Additional data (alcohol use history, other phenotypic measures)

ANA Battery

| Measure | Time | Type |
|--|------|--------------|
| Incentive Salience | | |
| Choice task (implicit) | 10 | Behavioral |
| Alcohol Approach-Avoidance Task | 10 | Behavioral |
| Drinking Identity Implicit Association Task | 5 | Behavioral |
| Hypothetical Purchase Task | 5 | Self-Report |
| Cue Reactivity Task | 8 | Neuroimaging |
| Monetary Incentive Delay Task | 15 | Neuroimaging |
| Negative Emotionality | | |
| Effort expenditure for rewards task (EEfRT) | 10 | Behavioral |
| PASAT (distress tolerance) | 5 | Behavioral |
| Cyberball | 10 | Behavioral |
| Probabilistic Reward Learning | 10 | Behavioral |
| Positive and Negative Affect Schedule | 5 | Self-Report |
| Snaith-Hamilton Pleasure Scale | 5 | Self-Report |
| Toronto Alexithymia Scale | 5 | Self-Report |
| Facial Emotion Matching Task | 10 | Neuroimaging |
| Executive Function | | |
| Stop Signal Reaction Task | 5 | Behavioral |
| Continuous Performance Task | 10 | Behavioral |
| Digit Span (Backwards) | 5 | Behavioral |
| Beads in a Jar Task | 5 | Behavioral |
| Manikin Test of Spatial Orientation | 10 | Behavioral |
| Trail Making Test | 10 | Behavioral |
| Metacognitions Questionnaire | 5 | Self-Report |
| Multidimensional Assessment of Interoceptive Awareness | 5 | Self-Report |
| Appetitive Go-NoGo | 5 | Neuroimaging |

ANA In Practice

- Individuals recruited through ongoing Screening and Natural History Protocol (SNHP)
- Behavioral and self-report measures grouped into four blocks
- Outpatients return for “ANA Day”
- Inpatients complete measures over two separate days
- Neuroimaging assessments completed under separate protocol
- Data will be analyzed in conjunction with other collected measures (i.e., ancillary measures previously described)

Ongoing Challenges

- Refinement of domains
- Task selection and evaluation
- Data analysis
- Translation to clinical practice

Next Steps

- Final preparation and testing for implementation
- Begin data collection
- Pilot assessment package within NIAAA IRP
- Refine and reduce assessments as indicated

- Test in additional sample?

Thank you!

QUESTIONS?