



National Center for  
**PTSD**  
POSTTRAUMATIC STRESS DISORDER



# MOBILE COGNITIVE TRAINING FOR VETERANS WITH ALCOHOL USE DISORDER AND PTSD

Adrienne J. Heinz, Ph.D.

Substance and Anxiety Intervention Laboratory, Director  
National Center for PTSD & Center for Innovation to  
Implementation

Palo Alto VA Health Care System

# POLL

What is your background? (select all the apply)

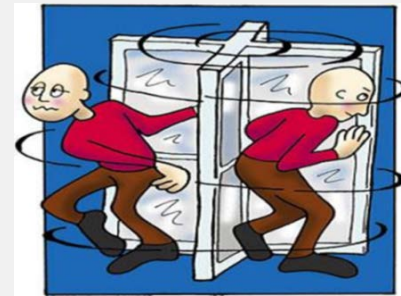
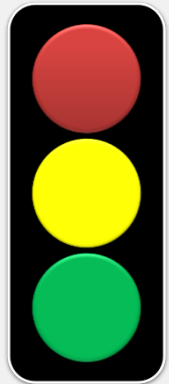
- a) Clinician – Ph.D., Psy.D., MSW, MFT
- b) MD
- c) CDA
- d) Researcher
- e) Other

# COGNITIVE DISRUPTIONS IN ALCOHOL USE DISORDER & PTSD

- PTSD one the most prevalent, costly and “sticky” comorbidities observed among individuals with AUD
  - 63-76% of OIF/OEF veterans with an AUD also have PTSD
- Trans-disease profile (e.g., NIMH, RDoC)
  - Focus on common neural systems
  - Neurocognitive dysfunction in AUD and PTSD
- Cognitive deficits associated with poor recovery outcomes
  - Cognitive training: A potential high-yield target for intervention?

# PROMOTING COGNITIVE HEALTH IN VULNERABLE POPULATIONS

- Help individuals strengthen the brake pedal and master the gas pedal
  - Disrupt the revolving door of chronic relapse and impairment
- Enhance the cognitive skills that are necessary for resilient responses to stress and adversity in recovery.
  - modulating attention, (yellow light)
  - regulating emotion, inhibiting responses, (red light)
  - planning more optimal responses (green light)

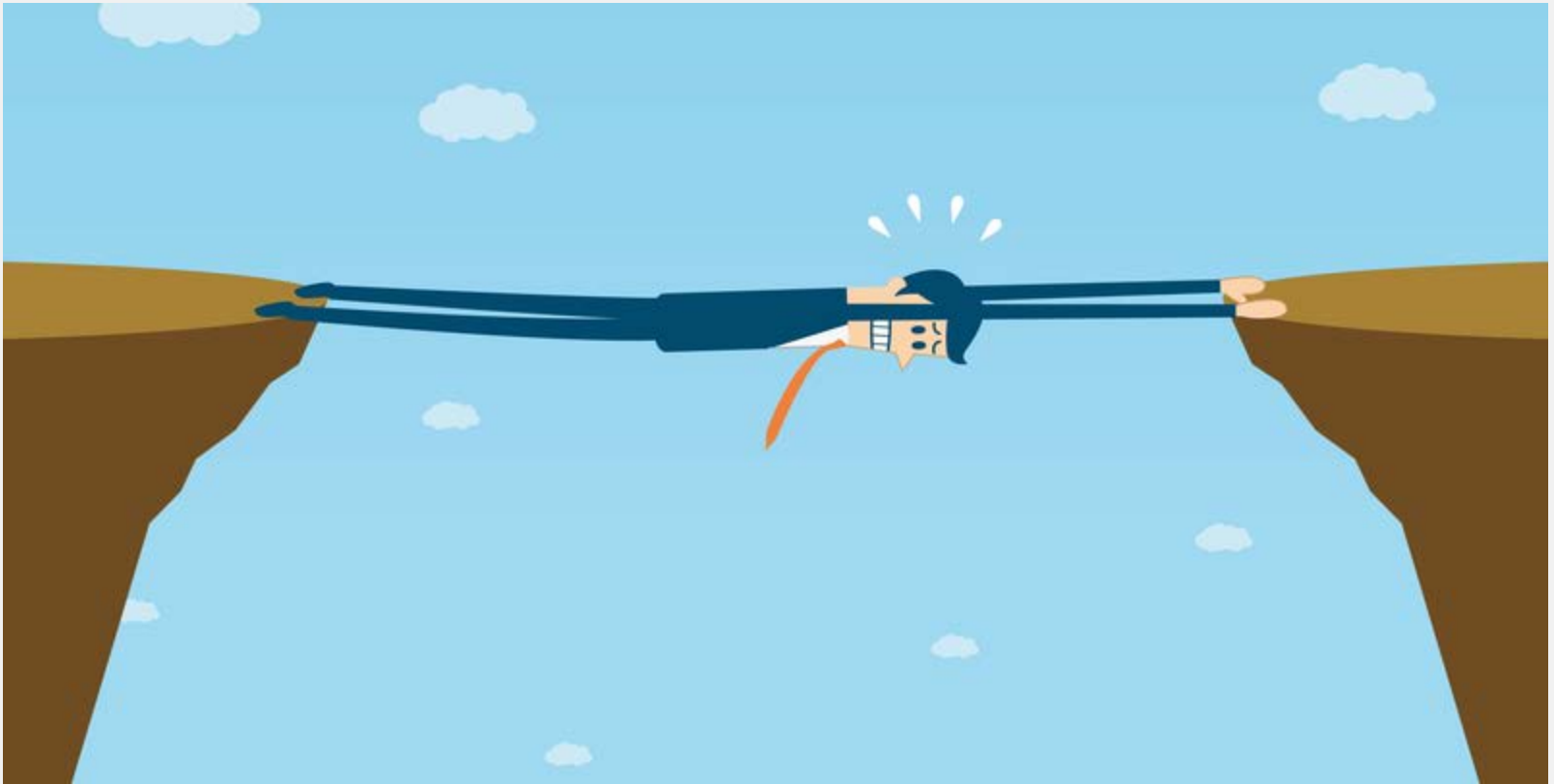


# APPROACH – DUAL PROCESS MODEL

- Targeted Neural Systems and Cognitive Domains:
  - Impulsive Reward-seeking system (limbically automated reward and threat-based habits)
    - Attentional biases; behavioral approach and avoidance bias
  - Prefrontal Control/Regulatory Executive System
    - Working memory, inhibition, sustained attention, cognitive flexibility



NICE IN THEORY. HOW ABOUT  
IN PRACTICE?



# PUBLIC PRIVATE PARTNERSHIP

- “Solving [today’s healthcare problems] will require deep partnerships between technology companies, clinical experts, patient advocates, and academic scientists.”
- Translating technological advances “*from code into care*” will rely upon the formation of creative alliances between healthcare, research, and commercial sectors.
- Federal funding has not kept up with inflation over the past decade and can be impeded by policy and administration changes.
- Private funding has immense resources, massive computing power, and can offer quick iterations of products.

# COGNITIVE TRAINING: PARTNERSHIP WITH POSIT SCIENCE

## Targeted Cognitive Domains

- Attention
- Visual Processing
- Executive Functioning
- Cognitive Bias for Alcohol and Threat





# COGNITIVE TRAINING TAILORED FOR PTSD & AUD

## Grin Hunting:

Objective: To train users **Attention** away from alcohol and threat-related cues

Task Instructions: Two images are presented; One positive and one threat or alcohol related. Users must decide if the image that replaces the positive image contains a smile.

## Category Click:

Objective: To Improve **Self Control** and **Reduce Approach Bias** to alcohol and threat-related images

Task Instructions: For every image that does not contain alcohol or threat, users must hit the button but they withhold a response if the image contains alcohol/threat cues.

## Mass Affect:

Objective: To sharpen **Emotional Working Memory**; improve **Attentional Control** by strengthening the ability to disengage and redirect attention away from alcohol and threat-related cues

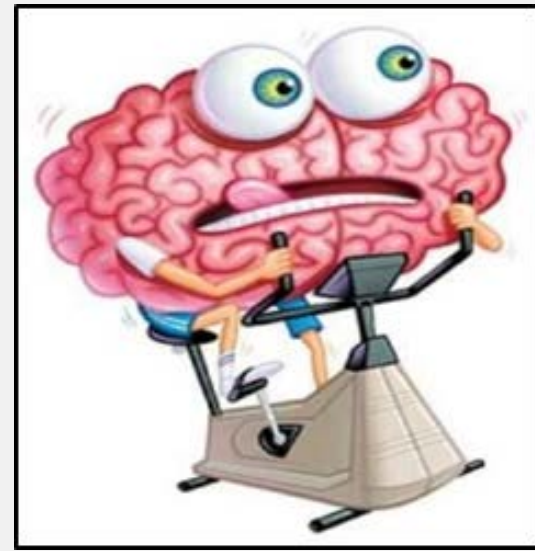
Task Instructions: One emotional image is presented. After a brief serial presentation of distractor images, three new images appear (1 includes alcohol or threat). Following this, users must pick the image that displays the same emotion as the initial image.

# DEMO

- <https://www.youtube.com/watch?v=szNhs4PhFHw&feature=youtu.be>
- <https://www.youtube.com/watch?v=uVWZGLLeZdSM&feature=youtu.be>

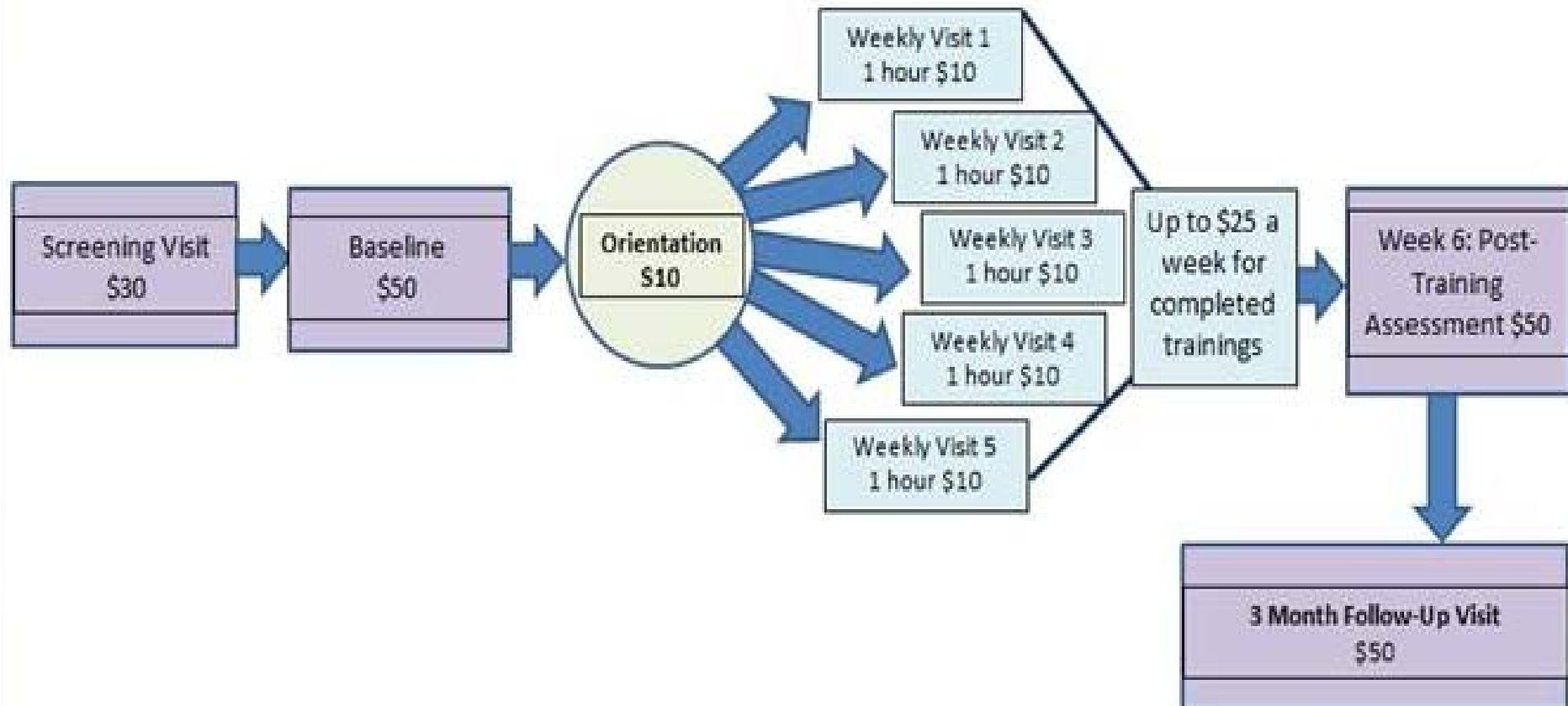
# STUDY OBJECTIVES

1. To determine the feasibility and tolerability of mobile cognitive training for veterans with AUD and PTSD
2. To assess the efficacy of the cognitive training program to improve cognitive functioning and reduce clinical symptoms related to AUD and PTSD



# STUDY DESIGN

- 6-weeks of training; ~22 hours; 10 visits; randomized to receive cognitive training or game control (trivia); assessments at pre and post training and 3 months later



# PARTICIPANTS

- 87 individuals enrolled/randomized:
  - Demographics:
    - Mean Age=40.4 (SD=11.5)
    - 52% Caucasian, 18% Hispanic, 17%, Multiple Races, 8% African American
    - 93% Male
    - Mean Education Years (GED=12)=14.0 (SD=1.8)
    - Mean Wechsler Test of Adult Reading (WTAR) score= 103.2 (12.2)
    - 76% of individuals were in a Restricted Environment
    - Mean PTSD symptom (PCL-5)= 46.5 (14.7); possible range 17- 85
    - Mean AUDIT score= 24.1 (9.5); possible range 0 to 40
    - 54 completed the intervention

# CLINICAL AND COGNITIVE SELF-REPORT MEASURES

- Clinical Outcomes:
  - PCL-5 (DSM-5): PTSD Symptoms Checklist
  - AUDIT: Alcohol Use Disorder
  - OCDS: Obsessive Compulsive Drinking Scale
  - IPF: Inventory of Psychosocial Functioning
- Cognitive Functioning:
  - EMQ: Everyday Memory Questionnaire
  - DQ: Dysexecutive Questionnaire

# NEUROPSYCHOLOGICAL MEASURES

Domain	Test	Specific Functions
<b>Basic Attention and Cognitive Bias</b>	Trail Making Test Part A WAIS-IV Digit Symbol Coding Approach-Avoidance Task	Visuomotor Attention and Processing Speed Attentional and Cognitive Biases for Alcohol and Threat
<b>Verbal and Visual Learning &amp; Memory Working Memory</b>	Brief Visual Memory Test-R Hopkins Verbal Learning Test-R WAIS-IV Digit Span WAIS-IV Letter/Number Sequencing	Visuospatial learning and recall memory Auditory learning and recall memory Mental Tracking, Organization, Sequencing Mental Reorganization; Sequencing
<b>Impulsivity and Decision Making</b>	Delis-Kaplan Color-Word Stroop Test Continuous Performance Task Iowa Gambling Task Delay Discounting Task	Inhibition of an over-learned response Sustained Attention, Vigilance, Inhibition Decision-Making, Risk-taking Decision-Making, Reward Processing
<b>Mental Flexibility</b>	Wisconsin Card Sorting Task Delis-Kaplan Tower Task Trail Making Test Part B	Rule-Learning, Set-Shifting Planning, Rule-Learning Speeded Set-Shifting

# PRELIMINARY RESULTS

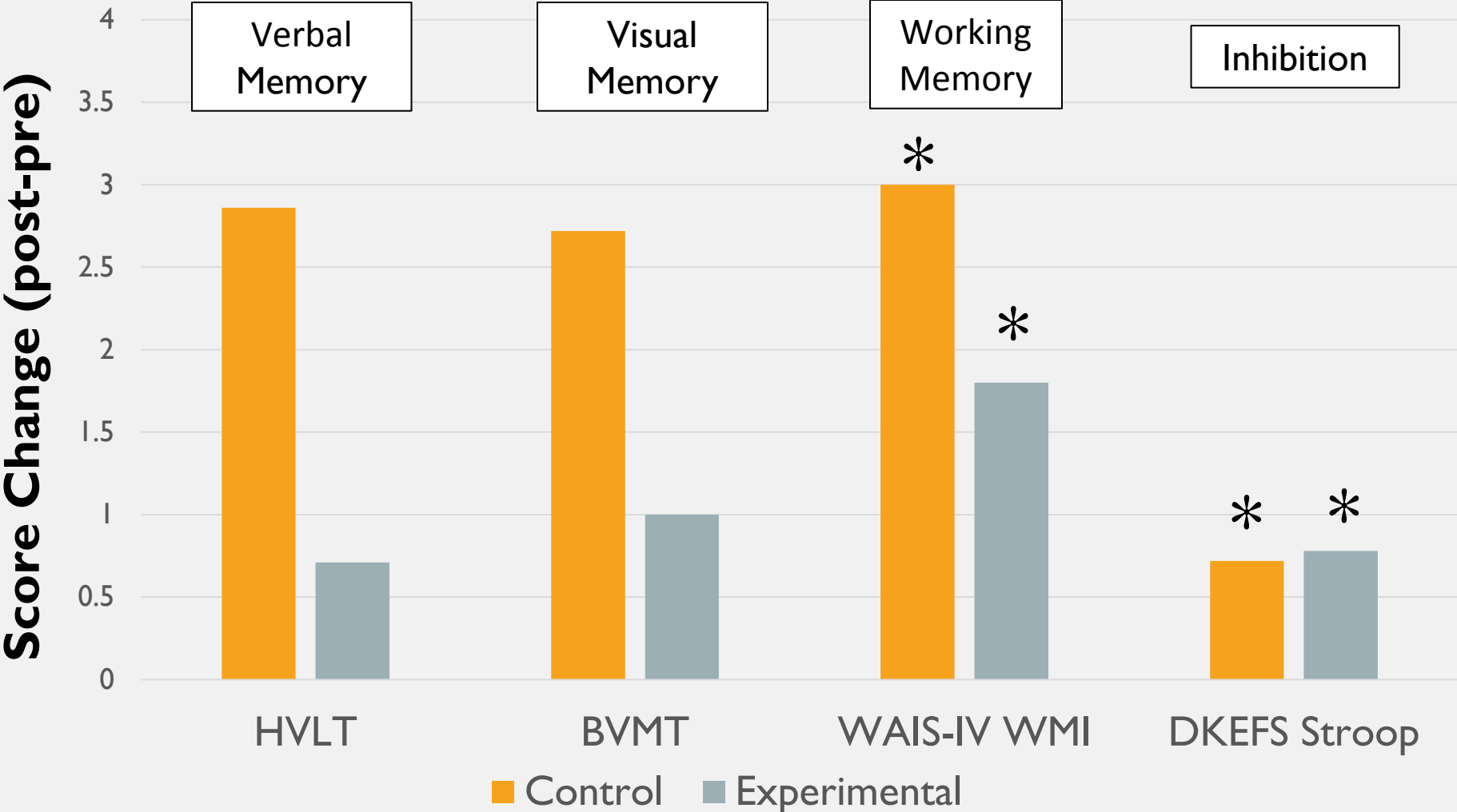


# CLINICAL SELF-REPORT

Domain Outcome	Control (n = 28)		Experimental (n = 26)	
Clinical Outcomes	Pre	Post	Pre	Post
Obsessive Comp Drinking Scale	<b>17.04 (13.10)</b>	<b>11.78 (8.59)</b>	13.50 (9.50)	11.69 (8.97)
AUDIT	24.32 (10.49)	21.61 (12.20)	22.81 (7.82)	20.11 (9.83)
PCL-5/PTSD Checklist	<b>49.54 (14.57)</b>	<b>40.64 (19.59)</b>	<b>45.77 (15.11)</b>	<b>36.04 (16.15)</b>
Inventory Psychosocial Function	44.76 (11.88)	40.94 (11.12)	<b>48.86 (14.82)</b>	<b>40.41 (13.53)</b>
Cognitive Functioning Self Report				
Everyday Memory Questionnaire	<b>140.11 (64.09)</b>	<b>110.08 (52.71)</b>	<b>127.84 (53.00)</b>	<b>113.69 (56.05)</b>
Dysexecutive Questionnaire	38.93 (15.05)	34.32 (14.57)	34.42 (11.85)	33.38 (10.94)

# NEUROPSYCHOLOGICAL MEASURES

Change in neuropsychological outcomes from pre to post by condition



# OTHER NEUROPSYCHOLOGICAL MEASURES

Domain Outcome	Control (n = 28)		Experimental (n = 26)	
	Pre	Post	Pre	Post
<u>Neuropsychological</u>				
Trails B (set-shifting)	48.70 (10.01)	49.93 (11.71)	<b>47.29 (12.67)</b>	<b>51.00 (12.71)</b>
DKEFS Tower (planning)	10.50 (2.06)	11.00 (2.00)	11.00 (2.70)	11.833 (1.97)
BART pumps (risk-taking)	32.28 (16.10)	28.41 (13.16)	32.68 (14.97)	31.99 (15.10)
Connors CPT (sustained attention, inhibition)	50.88 (9.52)	50.11 (8.44)	49.54 (9.03)	47.92 (10.59)
WCST (mental flexibility)	47.96 (9.00)	51.38 (7.28)	48.61 (9.28)	48.65 (14.25)
IGT (decision making)	-829.60 (1387.79)	-371.40 (1929.80)	166.97 (1405.33)	760.65 (1547.92)

## IF WE BUILD IT WILL THEY COME [BACK]?: FEASIBILITY AND TOLERABILITY

- 54 participants completed 6-weeks of training (62% retention)
  - 28 Control (73% retention)
  - 26 Experimental (54% retention)\*
- Experimental condition:
  - 44% would recommend to another (detractor)
  - 34% believed it helped their thinking/memory
  - Average enjoyment (range 1-10): 6.32
- Control condition:
  - 61% would recommend to another (promoter)
  - 45% believe it helped their thinking/memory
  - Average enjoyment (range 1-10): 7.39

# NIH NIAAA SMALL BUSINESS INNOVATION RESEARCH GRANT

- Addition a third training arm
- Refinement of the training app
  - Training schedule is now more personalized
  - Provides more engaging feedback
  - Orientation video to enhance motivation
  - Instructional videos to facilitate understanding of exercises
- Hypothesis: Dose = Implementation
  - Added features should support and enhance program engagement and completion

# LESSONS LEARNED

- Study coordinator reflections:
  - Decreasing the amount of in person visits may increase retention
  - SUD/PTSD is a challenging population – competing priorities
  - Importance of the first week of training
  - Daily reminders given through the app or another method may help ensure training is occurring consistently throughout the week
  - Effectively communicating the “why” is of utmost importance
  - Intrinsic vs. extrinsic motivation



## FUTURE DIRECTIONS/CONCLUSIONS

- Recruitment through 2019; n = 163
- Participants in both the control and cognitive training groups improved on separate and some overlapping clinical outcomes and measures of neuropsychological performance.
- Dismantling study to identify the most active ingredients
- Does time training and degree of achievement in training mediate improvements in neuropsychological and clinical functioning?
- Beyond pathology: Does cognitive training promote resilience and functioning?

# ACKNOWLEDGEMENTS AND QUESTIONS?

## Contact info

- [Adrienne.Heinz@va.gov](mailto:Adrienne.Heinz@va.gov) OR [Adrienneheinz@gmail.com](mailto:Adrienneheinz@gmail.com)

## Research Team

- Brienna Meffert, Danielle Sawicki, Catherine Hausman, Rachel Santiago, Michelle Mosich, Emma Lucas, Mayra Gomez, Maggie Berkemeyer

## Mentoring Team

- Sophia Vinogradov, M.D., Marcel Bonn-Miller, Ph.D.

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