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Current Perspectives on Trauma, Memories, Substance Use, and Treatment

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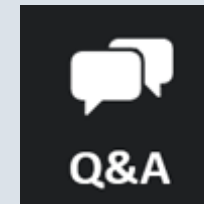
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Robin Gay, PhD



Rocco A. Iannucci, MD

PRESENTERS

- **Robin Gay, PhD**
Director of Psychological Services,
Fernside, McLean Hospital
Instructor in Psychology, Department of
Psychiatry, Harvard Medical School
- **Rocco A. Iannucci, MD**
Director, Fernside, McLean Hospital
Instructor in Psychiatry, Harvard Medical
School

Trauma, PTSD, Memory and Alcohol: Current Perspectives and Treatment

Robin Gay, PhD

Instructor in Psychology, Harvard Medical School

Director of Psychological Services/Postdoctoral Training, McLean Fernside

Memory and Trauma Overview

- Neurobiology of Trauma Memories: how does the biological response to psychological trauma affect memory?
- TBI, affects on memory. Post Traumatic Amnesia (PTA), neurochemical storm that disrupts encoding.
- Trauma, PTSD and Alcohol can have negative and synergistic impacts on memory that effect treatment.
- Normal memories undergo consolidation and become part of episodic memory.

Neurobiology of Trauma Memories

- What happens during psychological trauma?
- Amygdala (part of the limbic system) responds and detects threat.
- Hypothalamic-Pituitary-Adrenal axis (HPA axis) is activated, sending a signal to the pituitary glands, then to adrenal glands to release hormones to prepare the individual to best survive.
- This is the well-known fight, flight, or freeze response.

Neurobiology of Trauma Memories

- During trauma while amygdala activity is increased, hippocampal functioning is hampered.
- Hippocampus is where memory for events are stored in a contextual and chronological format before undergoing consolidation.
- Retrieval cues for the strong emotional and fear based memory may remain, while the specific details, such as what day it occurred, contextual information or sequencing (which is the domain of the hippocampus) may not be well encoded.

Neurobiology of Trauma Memories

- Trauma memories often occur in the form of sensory information such as perceptions, sounds, images or smells.
- Christopher Brewin, (2011) these memories “are often fragmented in time, and for the most part consist of primary sensory information (images, smells, sounds) that are linked to physiological fear symptoms.”
- The prevailing thought is that trauma memories are stored both as images and in narrative format, known as dual representation.
- In this way they are partially stored in autobiographical memory, yet are not easily verbalized as they may be fragmented and lack context, which can impact treatment.

Memory Disruption in PTSD

- Gaps in Declarative memory (Recall) are one of the diagnostic criteria for Post-Traumatic Stress Disorder ([Samuelson Kristin, 2011](#)).
- PTSD, Criterion D, individuals must have 2 or more of seven different symptoms in this domain, one of which is an “inability to remember key features or an important aspect of the trauma” (DSM-5).
- PTSD: may involve both unwanted intrusive memories and gaps in recall regarding important details, including autobiographical information. Brewin (2007) notes, “PTSD sufferers may be perfectly able to provide a general account to others of what happened to them that is rehearsed and coherent but that omits details of the worst moments of the trauma.”

Alcohol Use, Trauma and PTSD

- National Center for PTSD (PTSD.va.gov) alcohol is associated with an increased risk of PTSD. Alcohol problems are more prevalent in people who have experienced trauma. Substance problems - risk for individuals with high ACE's (Adverse Childhood Events).
- Up to 75% of people who have experienced abuse or violence report drinking problems, while 1/3 with severe illness, accidents, or disaster report problems with alcohol (PTSD.va.gov).
- 60-80% of Vietnam vets entering treatment for PTSD were found to have problems with alcohol (PTSD.va.gov).
- Alcohol use negatively impacts PTSD, treatment course and outcomes.

Alcohol and PTSD: Impacts on Memory

- Understanding how AU and trauma affect memory is helpful in developing methods to treat PTSD.
- Study on Veterans of 9/11 found combined effect: alcohol use and combat exposure was found to negatively impact visual working memory. (Aase et al, 2022).
- Cognitive Remediation may improve PTSD symptoms (Aase et al, 2022).
- Cognitive Remediation may also improve memory impairment resulting from Alcohol use. Alcohol affects memory and executive functioning - increased risk of early onset dementia (AUD-MCI DSM-V).
- Other research also appears to support use of CRT, (Bell et al 2021).

Effects of PTSD and Trauma on Memory

- Veterans with PTSD and trauma exposure have changes to hippocampal volume (Bremmer et. al 1996).
- Persistent trauma can also result in brain changes for areas responsible for memory and executive functions (Daniels et al., 2016; Woon et al., 2010) in Gold et. al 2021.
- Alterations in myelination axons (thinner/thicker), nucleus accumbens (reward center of the brain), and changes to the corpus callosum. Decreased hippocampal volume and increased amygdala volume (Teicher, 2016 and 2012).
- Childhood trauma/neglect results in changes in the HPA Axis (Grassi-Olivera, Ashy, Stein, 2008).
- Other research shows decreased performance on short term memory, working memory, and episodic memory (Dodaj 2017).

Memory Impairment May increase Risk of PTSD

- Complex relationship between memory and PTSD
- People with prior memory deficits may have a higher incidence of developing PTSD. (Samuelson, 2011)
- Declarative memory impairment may be a risk factor for PTSD, rather than a result of trauma. Impaired CVLT, RAVLT, narrative memory, paired associates. (Samuelson, 2011) although this is debated in some studies.
- Additionally, severity of PTSD symptoms predicts level of cognitive decline in older patients.
- Need to treat symptoms of PTSD to maintain brain health (Prieto et al, 2023)
- Could early trauma lead to brain changes that make PTSD more likely?

CRT Treatments for PTSD and AUD

- Cognitive Remediation Training: Has been used to treat AUD and also PTSD.
- Individuals with PTSD who have cognitive deficits in multiple domains and in executive functioning have worse outcomes.
- Domains affected - declarative memory, STM, attention and executive functioning (Lanius, 2015).
- CRT has also been used for patients who have SUD. Helpful for working memory, processing speed, executive functions and correlates to improvements in SUD among patients without cognitive impairments (Bell, 2021).

Trauma and Memory Treatment

- Help the individual to feel comfortable with what they do and do not recall
- Evidenced Based Treatments
 - *CPT (Cognitive Processing Therapy), PE (Prolonged Exposure), CT (Cognitive Therapy), CBT.*
 - *CPT, focus on re-interpreting one's beliefs about the trauma and challenging beliefs about the trauma that are not helpful (usually 12 sessions). Challenging these unhelpful beliefs helps lessen the symptoms of PTSD and improve the individuals functioning.*
 - *Focus on non-judgmental compassion, providing psychoeducation, and challenging unhelpful cognitions about the event, especially when memory is impaired.*
 - *CRT treatment may also be useful*

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Binges, Blackouts, and Recovery: Memory as a Potential Therapeutic Target

Rocco Iannucci, M.D.

Instructor in Psychiatry, Harvard Medical School

Medical/ Program Director, McLean Fernside

Objective

- Review Alcohol Induced Blackouts (AIB)
- Explore memory/ executive function as a therapeutic target

Alcohol-Induced Blackout (AIB)



Alcohol-Induced Blackout (AIB)

- Loss of memory for events occurring after drinking
 - *En bloc*
 - *Fragmentary (“brown-out”)*
- 50% prevalence in college students
- Risk factors:
 - *Genetic*
 - *High alcohol level*
 - *Rapid increase in alcohol level*



(Wetherill and Fromm, 2016)

Binge Drinking

- Definitions vary (BAC, quantity consumed)
- 40% of U.S. young adults report monthly binges
- AUD, binge drinking, and AIB are associated with sustained deficits in executive function
 - *May improve with cessation of binges*
- Increased risk of alcohol-related injury/death, risky sexual and other behaviors, perpetrating or being victimized by sexual violence

(Carbia et al., 2017; Hermens and Lagapoulos, 2018)

AIB: Neurobiological Mechanisms

- Deficient transfer of information from (relatively intact) short term memory to longer term memory
- Alcohol-related dysfunction in frontal and hippocampal regions contributing to memory consolidation
- Functional neuroimaging has revealed decreased GABA neurotransmission and markers of oxidative stress in relevant brain regions with AIB

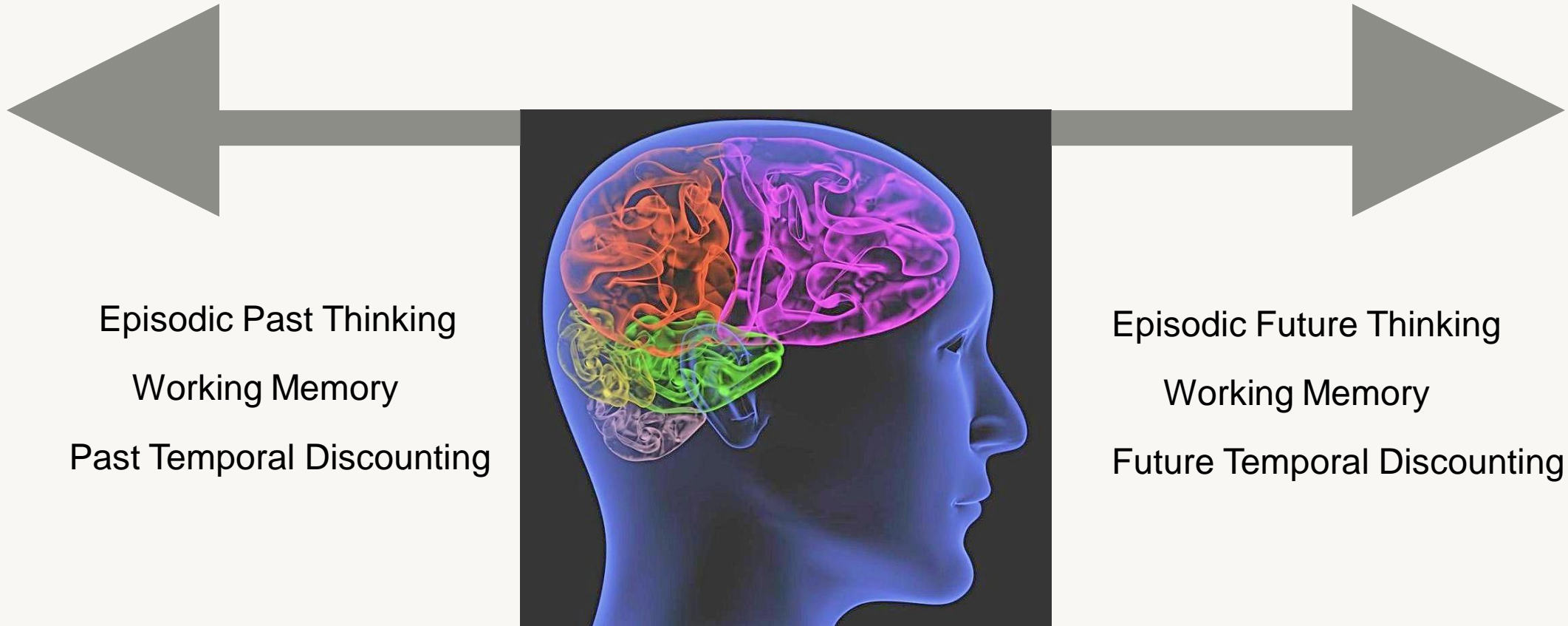
(Hermens and Lagopoulos, 2018)

AIB: Clinical Interventions

- Educating patients on behavioral risks and potential consequences
- History of AIB is associated with benefit from personalized normative feedback intervention
- Many college students also drink with intention of AIB
- Identify and treat AUD

(Miller et al., 2019)

Memory as a Therapeutic Target



Alcohol Use and Memory

- Adolescents with BD pattern show deficits in measures of episodic memory that improve with cessation of BD
- Binge drinking and AUD are associated with decreased executive functioning (including episodic and working memory)

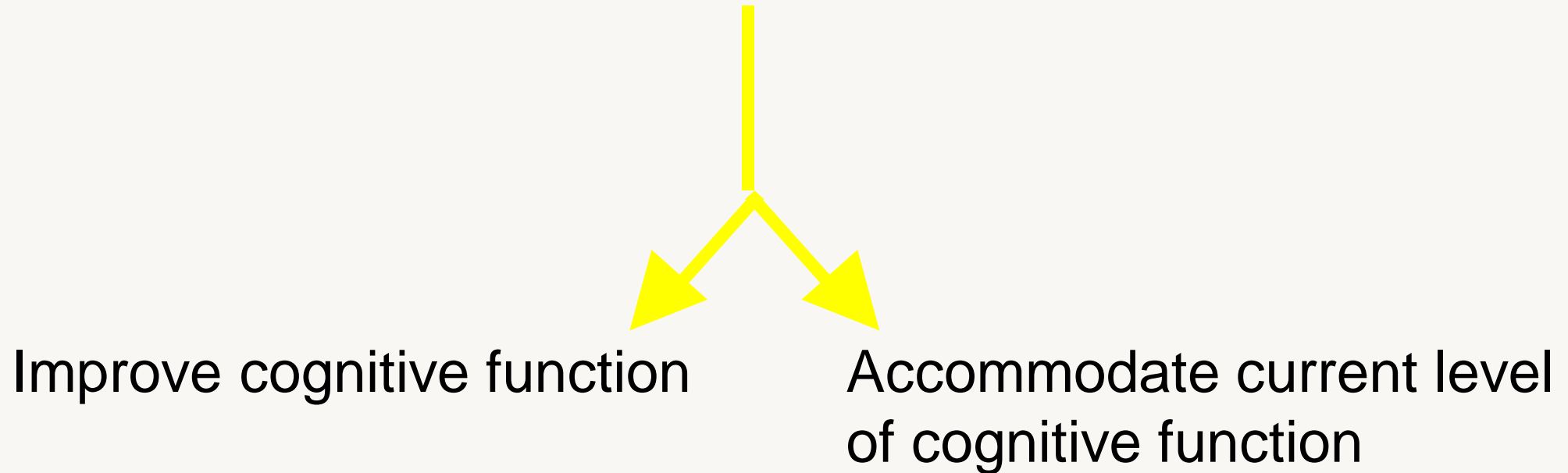
(Carbia C et al., 2016)



Working Memory (WM)

- Retention of small amounts of information in ready access to facilitate a current cognitive task.
- Often discussions of WM implicitly include other executive skills to manage that information.

Working with Memory



Memory as a Therapeutic Target

- Interventions to improve working memory (or executive function broadly)
- Designing treatment optimally for patient's working memory capacity

(Cowan, 2014)

Working Memory Training: Clinical Trials

- Opioid Use Disorder (treated with methadone)
- Methamphetamine Use Disorder
- Alcohol Use Disorder and heavy alcohol use
- Executive functioning improves with cessation of substance use

(Snider et al., 2018; Khemiri et al., 2019; Bickel et al. 2011, 2014; Houbin et al., 2011)

Medications to treat AUD/ PTSD

- Indicated by the Food and Drug Administration:
 - *PTSD (sertraline, paroxetine)*
 - *AUD (acamprosate, naltrexone, disulfiram)*
- Investigated with co-occurring AUD and PTSD (mixed results)
 - *Prazosin*
 - *Naltrexone*
 - *Sertraline*
 - *Topiramate*

(Verplaetse et al., 2018)

Medications and Memory (Investigational)

- Ketamine
 - *Affects long-term potentiation*
- Propranolol
 - *Memory reconsolidation*
- MDMA
 - *Fear memory extinction*
 - *Memory reconsolidation*

*(Kelson et al., 2023; Phillip-Muller et al., 2023;
Roullet et al., 2021; Brunet et al., 2018; Mitchell et al., 2021)*

Summary

- Alcohol use has substantial impact on executive function acutely and chronically
- Asking about blackouts may provide therapeutic opportunities
- Executive functioning and memory may offer new avenues to help patients
 - *Retraining*
 - *Psychopharmacology*
 - *Providing treatment that matches patient capacities*

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AUDIENCE Q&A

FINAL THOUGHTS

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