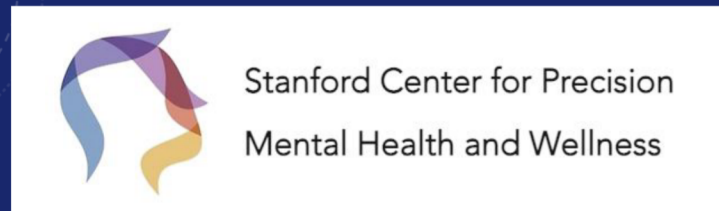


# A Case of Dreaming During Light Sedation Improving Traumatic Memories

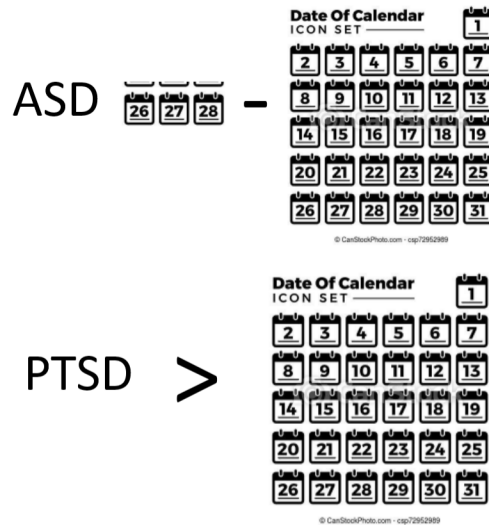
Mood Disorders Education Day  
August 20, 2022

Laura M. Hack, MD, PhD  
Assistant Professor, Stanford University  
Director of Novel & Precision Neurotherapeutics | Stanford Center for  
Precision Mental Health & Wellness



# Overview of Trauma-related Disorders

<b>Reliving</b> Flashbacks Nightmares Haunting memories	<b>Hyperarousal</b> Sleeping difficulties Easily scared Concentration difficulties Sweating, pain, trembling
<b>Mood and function</b> Memory problems Feeling detached Emotionally numb Guilty Suspicious Sad Irritable Anxious	<b>Avoidance</b> Avoiding reminders of trauma Avoiding emotions Avoiding thoughts



4%



8%



Symptoms:  
re-experiencing,  
hyperarousal, altered  
mood and cognition,  
and avoidance

Acute stress disorder  
(ASD)   
post-traumatic stress  
disorder (PTSD) as  
high as 83%

PTSD has a lifetime  
prevalence of 6-8%

\$232.2 billion in US  
in healthcare costs,  
disability, and lost  
productivity

# Treatments for PTSD are Inadequate

- Only two FDA approved medications
  - Remission rates are just 20%-30%<sup>1</sup>
- Prolonged exposure therapy = gold standard psychotherapy for PTSD
  - Trained therapist supervises imaginal exposure
  - Highly effective<sup>2</sup>
  - Time intensive -> 9-12 90-minute sessions
  - High dropout rate (22%)<sup>3</sup>



<sup>1</sup>Alexander et al., 2012, *Pharmacy & Therapeutics*; <sup>2</sup>Powers et al., 2010, *Clin Psychol Rev*; <sup>3</sup>Lewis et al., 2020, *Eur J Psychotraumatol*.

# Anesthetic-Induced Intraoperative Dream Associated With Remission of a Psychiatric Disorder: A Case Report

Harrison S. Chow, MD, MS,\* Laura M. Hack, MD, PhD,†‡ Makoto Kawai, MD,†‡ and Boris D. Heifets, MD, PhD\*†

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A & A PRACTICE

- “Beth” is 26-year-old woman with multiple prior traumas but no PTSD
- November 2021: attacked by her sister-in-law with a knife
  - Severed tendons in right hand
- Developed Acute Stress Disorder
  - Prominent symptoms of nightmares, poor sleep, avoidance of knives, easy startle

# Beth's Surgery



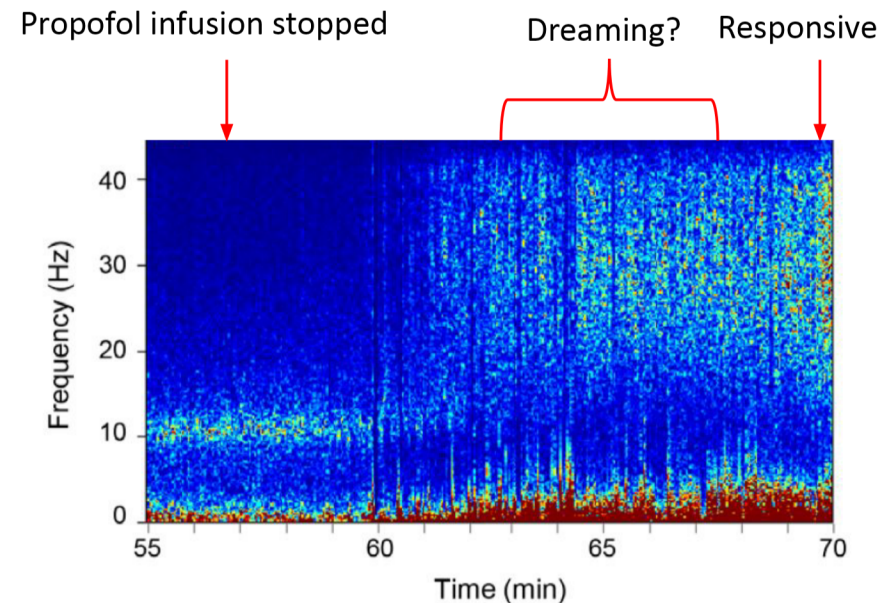
- Tendon repair of right hand 12 days after attack
- Anesthesiologist Dr. Harrison Chow noted Beth to be calm at first  crying inconsolably when describing the attack
- Deep sedation with propofol and pain control with fentanyl during repair   
“wake-up test” to assess tendon repair before surgical closure  closure while awake was completed without incident
- Upon emerging from anesthesia, Beth reported “waking up in a dream”

# Beth's Dream



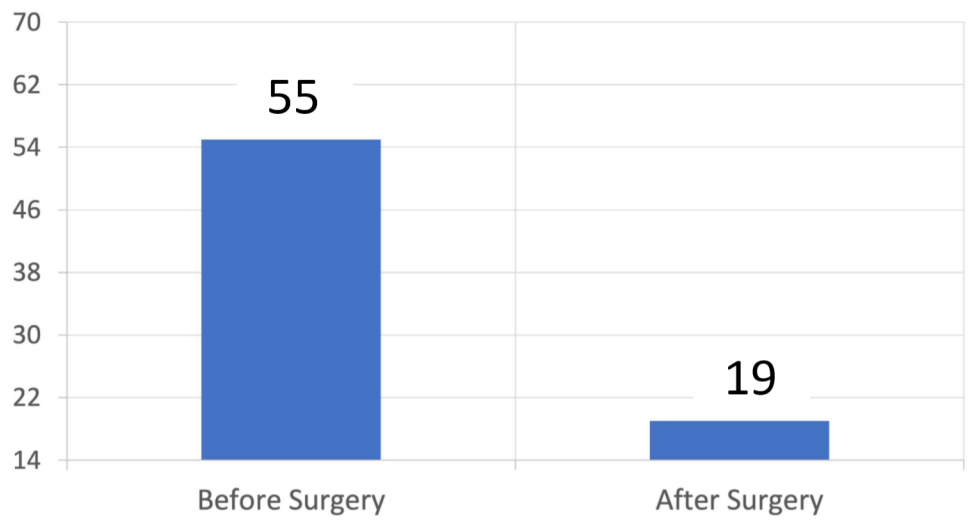
# Monitoring During Surgery

- EEG monitoring with frontal leads
- Peaks in the delta (1–4 Hz) and alpha (8–12 Hz) frequency bands  moderate sedation
- Propofol infusion stopped around 56 minutes  EEG transition to higher frequency (light sedation)
- Dreaming just prior to waking up  marked by beta waves (13–35 Hz)
  - Seen in rapid eye movement (REM) sleep
- In the PACU, Beth reported having the sensation of sleeping (in the operating room) for the first time since her attack



# Post-Operative Course

Acute Stress Disorder Scale-5



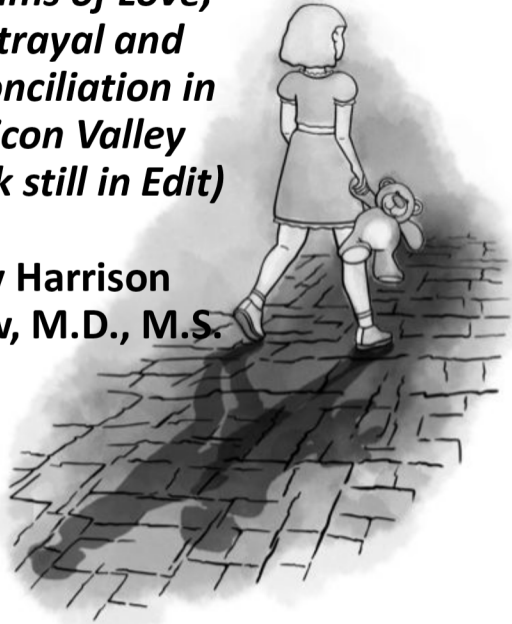
- Post-Operative Day 1
  - Normal sleep for first time since attack
- Post-Operative Day 7
  - No nightmares
  - Able to calmly describe attack to family
- Post-Operative Day 15
  - Did not meet criteria for ASD since attack, reduction in symptoms by 65%
- Denies return of symptoms 9 mos. later



# Possible Mechanisms of Symptom Resolution

***Broken-Hearted  
You: Propofol  
Dreams of Love,  
Betrayal and  
Reconciliation in  
Silicon Valley  
(book still in Edit)***

**by Harrison  
Chow, M.D., M.S.**



*Harrison Chow*

- Natural course of symptoms
- Placebo effect
- Prolonged anti-anxiety effects of propofol, fentanyl, and/or oxygen
- Specific effect of propofol-induced dreaming
  - Known to commonly induce recalled dreams<sup>1</sup>
  - Dr. Chow has observed dreaming in 50% of propofol cases

<sup>1</sup>Leslie et al., 2009, *Anesthesiology*

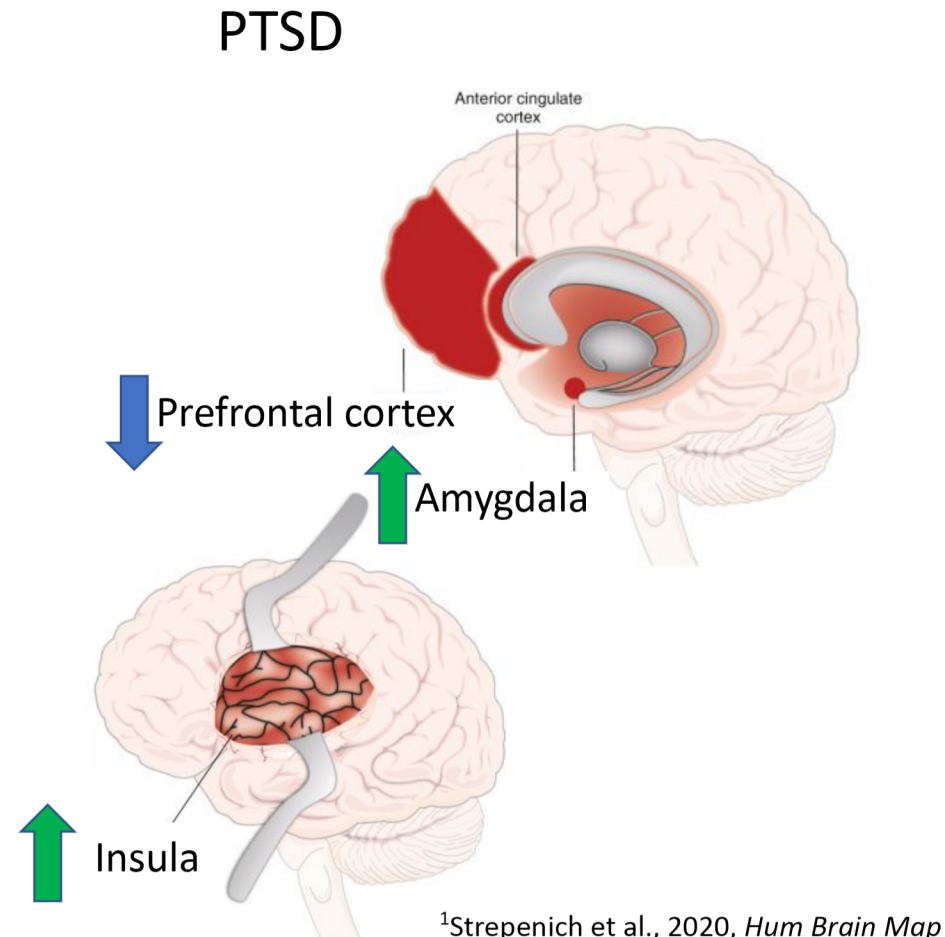
# Propofol-induced Dreaming

- **THREAD** = Therapeutic pRe-Emergence Anesthesia Dream
- Accelerated fear extinction process through dreaming?
  - Same process that occurs in prolonged exposure therapy
- Extinction memory is formed without negative emotional tone that competes with fear memory
- Evidence of fear extinction during dreaming in healthy subjects



# Fear Extinction During Dreaming

- More fearful dreams □ less emotional arousal and activation of fear-related regions (insula and amygdala) during waking with increased prefrontal cortex activity
- Fear during dreaming □ increased insula activity during dream<sup>1</sup>
- Individuals with PTSD may not have same benefit due to insomnia
  - Nightmares differ from bad dreams □ often awoken during nightmares



# Patients with PTSD

- “Jill” middle-aged female with PTSD and depression, on disability
  - Multiple assaults
  - Prominent symptoms: insomnia, agoraphobia
  - Dreamt about being in open, green, and flowery garden
    - Normally would be very fearful of this experience due to agoraphobia
  - After surgery, she had normal sleep and was able to be in open areas without fear
- “Hannah”: female in 20’s with history of combat-related PTSD
  - Dreamt about running errands prior to Thanksgiving
  - Reduction in CAPS-5 scores
- Symptom resolution only lasted days to weeks in both cases

# Many Remaining Questions

- Is a lasting therapeutic effect dependent on how long symptoms have been present?
- What is the relationship between dream content, emotional valence, and therapeutic effect?
- Can an EEG signature of propofol dreams be identified and used to induce THREADs?

# Current and Future Projects in Surgical Patients



Assess psychiatric symptoms in hand surgery patients with acute trauma and anesthesia-induced intraoperative dreams



Assess psychiatric symptoms in cancer patients with anesthesia-induced dreams during surgery



Evaluate EEG signatures of anesthesia-induced intraoperative dreams



Screen surgical patients for depression and refer for mental care health



PMHW  
Stanford Center for Precision  
Mental Health and Wellness

# Thank you!



## The Dream Team

**Patients**



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**PMHW**

Stanford Center for Precision  
Mental Health and Wellness

**PanLab**

Neuroscience is Personal



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# QUESTIONS