Objectively-characterized peritraumatic sleep phenotypes are associated with both pre-trauma characteristics and peritraumatic symptom outcomes

Oliver M. Holmes[1,2], Meredith A. Bucher[1,2], Thomas C. Neylan[4], Gari D. Clifford[5], Qiao Li[5], Qinghua Li[2], Robert F. Dougherty[6], Justin Baker[7,8], Sarah D. Linnstaedt[1,3], Tanja Jovanovic[9], Jennifer S. Stevens[5], Stacey L. House[10], Kerry J. Ressler[7,8], Ronald C. Kessler[8], Samuel A. McLean[1,2], Xinming An[1,3]

From: [1]The Institute for Trauma Recovery, [2]Department of Psychiatry, UNC-Chapel Hill, [3]Department of Anesthesiology, UNC-Chapel Hill, [4]University of California San Francisco, [5]Emory University School of Medicine, [6]Mindstrong Health, [7]McLean Hospital, [8]Harvard Medical School, [9]Wayne State University, [10]Washington University School of Medicine

Introduction

- Adverse posttraumatic neuropsychiatric sequelae (APNS) are common among military and civilian trauma survivors and often manifest as posttraumatic stress or post-concussion syndrome.
- Peritraumatic sleep responses to traumatic stress exposure such as changes in total sleep time (TST) and/or sleep efficiency (SE) are hypothesized to be associated with APNS.
- This project utilized multifaceted peritraumatic data from the AURORA study, including patient characteristic and wearable phenotyping data collected in the peritraumatic period, to examine how individual and peritraumatic sleep characteristics may interact to affect the development of APNS.

Methods

- Trauma survivors presenting to the emergency department (ED) after traumatic stress exposure were equipped with a Verily Study Watch for monitoring during the week after ED discharge.
- Watch accelerometer data were used to assess daily TST and SE.
- Trauma survivor characteristics were collected in the ED and serially thereafter using the smartphone-based Discovery by Mindstrong™ App.
- After data cleaning, linear mixed modeling was used to explore the associations between repeated measures of TST and SE over the first 7 days of sleep, demographic predictors, and self-reported peritraumatic sleep and symptom characteristics.

Table 1: Post-Cleaning Dataset and Patient Characteristics (n=2,305)

Hours of total sleep data (days)	271,469 (11,311)
Age in years (mean, SD)	35.5 (13.4)
Female (n, %)	1395 (60.5%)
Race (n, %)	
Hispanic	296 (12.8%)
Non-Hispanic Black	1123 (48.7%)
Non-Hispanic White	101 (4.4%)
Non-Hispanic Other	779 (33.8%)
Income (n, %)	
<=$19,000	608 (26.4%)
$19,001 to $35,000	549 (23.8%)
$35,001 to $50,000	231 (10.0%)
$50,001 to $75,000	148 (6.4%)
$75,001 to $100,000	123 (5.3%)
>$100,000	130 (5.6%)
Education Status (n, %)	
College Graduate and above	453 (19.7%)
Some college/associate degree	935 (40.6%)
High School Graduate or equivalent	635 (27.5%)
Less than high school	282 (12.2%)

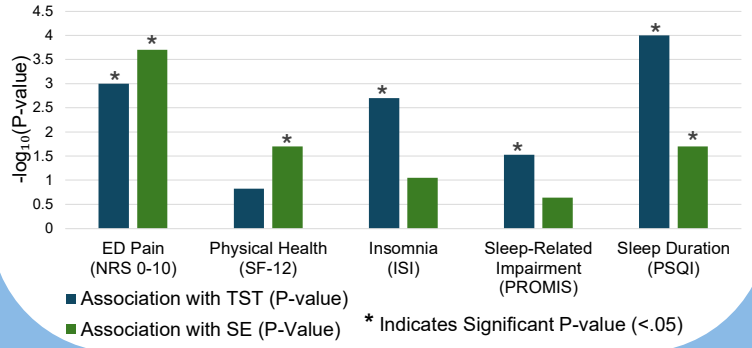
Table 2: Associations between survivor pre-trauma characteristics and total sleep time during the week after trauma (displayed as p values)

Predictor	P-value
Sex, Race, Education, Income, Marital Status, SF-12 Physical Health, Network Positive Interactions, Frequency of affiliated interactions with friends/relatives, Sleep Duration Score, Count of body regions with moderate/severe pain, Pre-trauma Pain Score, Lifetime Alcohol Use, BMI, Ethnicity	< 0.0001
Age, Pain catastrophizing, Vehicle Speed Limit, Dissociative Symptoms, Trauma – Perceived Chance of Dying, Dissociative Symptom (DESB RS), Moderate/Extreme Childhood Physical Neglect, Tobacco Use Frequency	0.0001 - <0.001
NIAAA Alcohol Use Group, Childhood Physical Abuse, Lifetime PCL-5 Score, Widespread Pain 2016 Definition, Religiosity total score, Big Five Inventory (BFI) – Neuroticism, Panic during Sleep	0.001 - <.01
Childhood Emotional Neglect, Childhood Trauma Total Score, Sum of Somatic Symptoms, SF-12 Mental Health, Any Childhood Trauma, Insomnia Score, Moderate/Extreme Childhood Sexual Abuse, Alcohol Use Quantity, BFI Category, Alcohol Use Frequency, Pre-trauma PCL-5 Score	0.01 - <.05

Table 3: Associations between survivor pre-trauma characteristics and sleep efficiency during the week after trauma (displayed as p values)

Predictor	P-value
Sex, Education, Income, Tobacco Use Frequency, Marijuana Use Frequency	< 0.0001
Age, Marital Status, General Health PCS, SF-12 Physical Health, Sleep Duration Score	0.0001 - <0.001
Knocked Out During Trauma, Panic during Sleep, Employment Status, Pre-trauma Pain Score, Race, BMI Category, Widespread Pain 2016 Definition, Insomnia Score, Count of body region with moderate/severe pain, Pain catastrophizing	0.001 - <.01
Lifetime Trauma Events Happened to You, Pain interference, Employment Status, Big Five Inventory (BFI) – Neuroticism, Dissociative Symptom (DESB Score)	0.01 - <.05

Table 4: Associations between peri-traumatic symptoms and sleep characteristics during the week after trauma



Results

- The life-history characteristics most strongly associated with total sleep time in the first week after trauma (Table 2) were sex, race, income, pre-trauma pain severity, and lifetime alcohol use.
- The life-history characteristics most strongly associated with sleep efficiency in the first week after trauma (Table 3) were age, sex, education, tobacco use frequency, and general health.
- Peritraumatic self-report sleep measures such as insomnia and sleep-related impairment at week 2 were significantly associated with TST, while sleep duration at week 2 was significantly associated with both TST and SE (Table 4).
- Pain experienced in the ED post-trauma also predicted diminished peritraumatic TST and SE (Table 4).
- Finally, peritraumatic sleep efficiency also predicted patient's Physical Health at Week 2 (Table 4).

Conclusions

- Individual pre-trauma patient characteristics predict the amount and efficiency of sleep in the week after trauma. These characteristics also predict APNS.
- Poor peritraumatic sleep and symptoms have been shown to be an important risk factor for APNS.
- Interventions which target total sleep time and sleep efficiency as important factors in reducing APNS and improving post-traumatic outcomes should be assessed further.

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References

- References available upon request.