Comprehensive Psychiatry 91 (2019) 22–28

Contents lists available at ScienceDirect

Comprehensive Psychiatry

journal homepage: www.elsevier.com/locate/comppsych

Sleep-related problems and suicide behavior and ideation among Black and White trauma-exposed psychiatric inpatients☆

Rheeda L. Walker [a,*], David C. Talavera [a,b], Faith Nomamiukor [a], Ijeoma J. Madubata [a], Candice Alfano [a,c], Anka A. Vujanovic [a]

[a] Department of Psychology, University of Houston, Houston, TX 30602-3013, USA
[b] Harvard Medical School/Cambridge Health Alliance, Cambridge, MA 02139, USA
[c] Texas Institute for Measurement, Evaluation, and Statistics, University of Houston, Houston, TX 30602-3013, USA

ARTICLE INFO

Keywords:
Sleep
Suicide
Race
Ethnicity
Trauma

ABSTRACT

Objective: Sleep-related problems (SRPs) are associated with increased risk for suicide-related behavior and death. Given that Black adults report greater SRPs as compared to White adults, the purpose of the current study was to examine sleep problems, suicide-related psychiatric admission, and suicide ideation, in Black and White trauma-exposed adults.

Method: Suicide-related behavior (i.e., intent, plan, and/or behavior) as reason for hospital admission was obtained via medical records review for 172 Black and White adults who were admitted to an acute-care psychiatric facility; all participants completed validated measures of sleep quality and suicide ideation.

Results: Adjusted logistic regression analyses revealed that sleep-related daytime dysfunction (AOR = 4.32, $p < .05$) and poor sleep quality (AOR = 3.64, $p < .05$) were associated with significantly increased odds that Black participants were admitted for suicide-related psychiatric care. Poorer sleep quality (AOR = 2.10, $p < .05$) was also associated with increased odds of suicide-related admission among White participants. However, shorter sleep duration was marginally associated with suicide ideation in Black participants only.

Conclusions: SRPs may be related to suicide-related behavior and ideation differently for vulnerable Black and White adults. More research is needed to understand potential race group differences and mechanisms by which SRPs increase risk for suicide crisis across racial groups.

1. Introduction

In the United States (U.S.), suicide is the 10th leading cause of death, occurring at an estimated rate of 14.5 per 100,000 individuals [1]. Approximately 400,000 persons are hospitalized for suicide crisis each year [2]. Despite decades of theoretical and empirical research, suicide-related behavior is challenging to detect [3,4]. Assessment of sleep-related problems (SRPs), however, provides an important index for heightened suicide risk. Difficulties with sleep are a warning sign for suicide [5]. Importantly, suicide warning signs differ from suicide risk factors in that warning signs suggest suicide behavior is more likely to occur within hours or days rather than years [6,7]. Bernert and Joiner (2007) called for increased attention to sleep-related factors in suicide risk assessment to more effectively guide clinical care, prevention, and intervention efforts. Such assessment would also advance non-intrusive suicide risk evaluation among vulnerable, underserved populations who may be less likely to disclose suicide thoughts and plans. Though studies reveal significant sleep disparities for Black compared to White adults, as well as with differences in suicide risk patterns, no known studies have examined sleep and suicide patterns across these racial groups. The primary aim of this study was to examine sleep-related problems as a predictor of suicide ideation and behavior among high-risk Black and White trauma-exposed psychiatric inpatients.

1.1. Sleep-related problems and suicide

Sleep is a critical biological function necessary to maintain physiological and emotional well-being. The term 'sleep disturbance' has been broadly defined as complications in the quantitative and/or qualitative properties of sleep [8]. Poor subjective sleep quality, delayed sleep onset, short duration of sleep, low sleep efficiency, and daytime dysfunction each constitute a different type of sleep disturbance or SRP [9,10]. The empirical sleep literature has revealed notable differences in the SRP-suicidality association [11]. Some have reported an indirect

☆ The study was funded by the Hogg Foundation for Mental Health (JRG-263) awarded to Dr. Vujanovic, senior author.

* Corresponding author.
E-mail address: rlwo@uh.edu (R.L. Walker).

https://doi.org/10.1016/j.comppsych.2019.03.001

effect of insomnia on suicidal behaviors via depression, nightmares and thwarted belongingness in adults [12–14]. However, mixed findings exist for the mediating role of hopelessness in insomnia and suicide ideation; while some studies suggest an indirect effect [15], others show a direct effect of insomnia on suicidal ideation despite adjusting for hopelessness [16]. Other studies show that individuals who report excessive daytime sleepiness also report more severe depressive symptoms and suicidal behavior [17]. Sleep duration also affects suicidal behavior in that both hypersomnia [18] and short sleep durations (i.e., < 5 h of sleep; 19) have been directly associated with suicidal behavior. When considering comorbid mental disorders, panic, mood, and substance disorders mediate the association between short sleep and suicidal behavior in individuals with current suicidal ideation [19]. The available literature has yet to converge on a predictable mechanism or developmental course for SRPs to suicide behavior. However, preliminary findings suggest a strong sleep-suicide association whereby disruption in mood (e.g., depression), cognitive state (e.g., hopelessness), and/or maladaptive coping behavior (e.g., substance abuse) increases suicide risk among persons who experience sleep disturbance.

Disruption of bioregulatory systems governing arousal and reactivity is proposed as a mechanism by which sleep escalates suicide risk and death [20]. Though the specific pathway is unclear, the role of sleep in suicide risk seems to vary as a function of the type of sleep problem [21]. Despite advancements in sleep research, SRPs also disproportionally affect certain portions of the population more than others. Demographic factors, namely race and ethnicity, shape epidemiologic trends in sleep considerably. Previous research demonstrates that Black, Latinx, and Chinese adults experience higher prevalence of sleep difficulties and undiagnosed sleep disorders compared to White individuals [22]. Accordingly, the National Center on Sleep Disorders Research has called for more research on ethnic, cultural, and socio-economic factors associated with sleep disorders in its 2011 strategic research plan to help address these health disparities [23]. Black adults, in particular, are especially susceptible to unequal rates of sleep disturbance compared to White individuals [24].

Few studies have examined patterns of suicide risk across racial/ethnic groups despite race group differences in suicide risk. When available, the empirical evidence has diverged. As an example, mean age for suicide death is significantly lower for Black compared to White individuals [25,26]. Studies show that depression and family history of suicide are less prevalent among Black/African American persons compared to White individuals who die by suicide [25]. Thus, for Black adults who are more likely to be "hidden ideators" and disclose thoughts of suicide less readily than White adults [27], SRPs could provide a less stigmatized index of suicide ideation and behavior. Some differences in suicide risk factors may be addressed with increased attention to high risk (e.g., trauma-exposed) clinical populations.

The scientific literature points to distinct aspects of sleep that differ between Black and White individuals. One of the most cited differences is in sleep duration. Compared to White men and women, Black individuals are more likely to report shorter self-reported sleep duration over and above socioeconomic factors, medical conditions, and health behaviors [28,29]. Some studies show these differences over a 30-year time period [30]. Differences have also been corroborated using objective sleep measurements (i.e., polysomnography and actigraphy [22,24]. Objective data show that Black individuals experience poorer sleep efficiency, lengthier sleep-onset latency, lower percentage of non-REM Stage 3 sleep [31], and greater percentages of non-REM Stage 2 sleep compared to White individuals [32]. In addition, research shows that Black men and women also experience more daytime sleepiness, have higher odds of SRPs that are diagnosed as sleep apnea [22], and undergo longer sleep-onset latency [33] compared to other racial/ethnic minority adults and White individuals. Overall, several lines of evidence indicate that Black adults experience elevated SRPs compared to White individuals.

While some studies have examined associations for SRPs and suicidal behavior in multi-ethnic samples [12,34,35] no known study to date has either tested group differences or disaggregated racial/ethnic subgroups to examine patterns among specific groups that include Black adults. One study reported an inverse association for sleep "satisfaction" and suicide ideation for Kenyan adults [36]. However, published studies have yet to examine sleep and suicide among Black adults. Insight to SRPs in this group will not only facilitate advancements in detection, but also generate more inclusive treatments that address sleep-related health disparities.

1.2. Current study

Available studies reveal that SRPs are related to increased risk for suicide-related behavior. Though the association between sleep and suicide holds up across other racial and ethnic groups such that those who report more sleep-related difficulties also report more suicide vulnerability [37,38] no known study has examined SRPs and suicide risk in Black/African American adults. Since Black adults often receive suicide crisis services in emergency departments [39] as opposed to during routine clinical care, research among acute psychiatric populations is important for examining factors that may activate suicide ideation and suicide-related psychiatric admission. Further, a focus on trauma-exposure aligns with a growing body of sleep research highlighting the high prevalence of SRPs among trauma-exposed individuals—a population that is overrepresented by Black/African Americans [40,41]. The current study sought to address the following questions: (1) Do Black and White trauma-exposed adults differ in SRPs and sleep parameters (i.e., sleep quality, sleep latency, duration, disturbance or daytime dysfunction due to sleepiness)? (2) Which aspects of sleep (if any) increase risk for suicide-related psychiatric admission among Black and White adults? (3) Which types of SRPs are specifically associated with suicide ideation in an acute care psychiatric sample?

2. Method

2.1. Participants

Participants were recruited for a larger study of trauma and psychiatric disturbance. The sample was comprised of 209 psychiatric inpatients at a public, university-affiliated, acute-care psychiatric inpatient hospital in a large metropolitan area in the southwestern United States. No data are available for 120 participants who were invited but declined to participate in the study. Eligible individuals were those 18–65 years of age who reported a history of trauma exposure consistent with *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition* [42] PTSD Criterion A; see Life Events Checklist-5 below. Potential participants were deemed ineligible if they were unable to provide verbal and written informed consent or if they obtained a score below 20 on the Mini Mental Status Examination (see below). All sociodemographic data are summarized in Table 1.

2.2. Measures

2.2.1. Mini Mental Status Examination (MMSE; [43,44])

The MMSE is an 11-item instrument used as an objective screening tool for general mental status. The MMSE provides a brief assessment of abilities in the areas of attention, memory orientation (e.g., recall of words, recognition of sentences), and initiation and maintenance of verbal and motor responses. Scores range from 0 to 30, with scores below 20 indicating moderate cognitive impairment.

2.2.2. Medical records review

First, demographic information, including age, sex, race/ethnicity, and psychiatric diagnoses were derived from electronic medical records. Second, suicidality as a basis for current hospital admission (yes/no), defined as significant suicide ideation, including intent or plan, and/or suicide-related behavior that necessitated hospitalization

Table 1
Participant characteristics.

	Full sample ($n = 172$)	White ($n = 92$)	Black ($n = 80$)	Group differences[d]
Sex[a]				
Male	59.88% (103)	54.35% (50)	66.25 (53)	–
Female	40.11% (69)	45.65 (42)	33.75 (27)	–
Race[a]				
White	53.49% (92)	100% (92)	–	–
African-American	46.51% (80)	–	100% (80)	–
Relationship status[a]				
Single	68.02% (117)	57.6 (53)	80.0% (64)	–
Married	8.14% (14)	10.9% (10)	5.0% (4)	–
Divorced	12.21% (21)	18.5% (17)	5.0% (4)	–
Separated	8.14% (14)	10.19% (10)	5.0% (4)	–
Co-habitating	1.74% (3)	1.1% (1)	2.5% (2)	–
Widowed	1.74% (3)	1.1% (1)	2.5% (2)	–
Education				
Less than High School	25.6% (44)	20.7% (19)	31.5% (25)	
High School, GED	36.6% (63)	38.0% (35)	35.0% (28)	
Some college	23.8% (41)	23.9% (22)	23.8% (19)	
College diploma	8.1% (14)	10.9% (10)	5.0% (4)	
Graduate studies	0.6% (1)	1.1% (1)	0% (0)	
Graduate degree	1.7% (3)	2.2% (2)	1.3% (1)	
Data unavailable	3.6% (6)	3.2% (3)	3.4% (3)	
Mean duration of hospitalization (days)	8.55 (SD 4.65)	8.1	9.1	B > W
Mean number of psychiatric diagnoses	2.2 (SD 1.28)	2.3	2.1	W > B
Mean number of traumatic events	5.88 (SD 3.5)	6.14	5.57	
Diagnosis at discharge				W > B
Mood disorders	70.4% (121)	80.4% (74)	59.1% (47)	
Major depressive disorder	15.7% (27)	16.3% (15)	15.1% (12)	
Major depressive disorder NOS	7.6% (13)	8.7% (8)	6.3% (5)	
Bipolar disorder I/II	19.2% (33)	17.4% (16)	21.4% (17)	
Bipolar disorder NOS	21.5% (37)	29.3% (27)	12.5% (10)	
Substance induced psychosis/mood	2.9% (5)	2.2% (2)	3.8% (3)	
Mood disorder NOS	3.5% (6)	6.5% (6)	0% (0)	
Substance use disorders	7.4% (11)	6.6% (6)	6.4% (5)	
Cannabis abuse/dependence	1.8% (3)	2.2% (2)	1.3% (1)	
Amphetamine abuse/dependence	0.6% (1)	0% (0)	1.3% (1)	
PCP abuse/dependence	0.6% (1)	0% (0)	1.3% (1)	
Cocaine abuse/dependence	1.7% (3)	1.1% (1)	2.5% (2)	
Anxiolytic abuse/dependence	0.6% (1)	1.1% (1)	0% (0)	
Polysubstance abuse/dependence	2.1% (2)	2.2% (2)	0% (0)	
Psychotic-Spectrum Disorders	22.0% (38)	10.8% (10)	35.1% (28)	
Schizoaffective disorder	9.3% (16)	4.3% (4)	15% (12)	
Schizophreniform disorder	2.9% (5)	2.2% (2)	3.8% (3)	
Schizophrenia	8.1% (14)	4.3% (4)	12.5% (10)	
Psychosis NOS	1.7% (3)	0% (0)	3.8% (3)	
MR/borderline	0.6% (1)	1.1% (1)	0% (0)	
Adjustment disorder	0.6% (1)	1.1% (1)	0% (0)	
Number of prior suicide attempts[b]				B > W
0	51.16% (88)	53.3% (49)	48.8% (39)	–
1	20.35% (35)	26.1% (24)	13.8% (11)	–
2	7.56% (13)	6.5% (6)	8.8% (7)	–
3	5.23% (9)	4.3% (4)	6.3% (5)	–
5 or more	15.7% (27)	9.78% (9)	22.5% (18)	–
Suicidality as precipitant to hospitalization[c]	55.81% (96)	57.6% (53)	53.8% (43)	

Note. Values are N (%).
[a] Information on Sex, Race, and Relationship status were reported from the demographics questionnaire.
[b] Information on Prior suicide attempts obtained from patient's self report at nurse intake.
[c] Information on suicidality as the precipitant to hospitalization was reported from medical records.
[d] Reported group differences are significant at a $p < .05$ level. W = White sample; B = Black sample.

for stabilization, was obtained from medical records. The number of self-reported past suicide attempts also was extracted from the medical record and evaluated as a covariate. Psychiatric diagnoses were determined via clinical interviews between psychiatrists and patients. Discharge psychiatric diagnostic data were used to inform the diagnostic composition of the present sample since discharge diagnostic data are more comprehensive and provide a standardized time-point for extraction of diagnostic data.

2.2.3. Life Events Checklist-5 (LEC-5; [45])

The LEC-5 is a self-report measure used to screen for potentially traumatic events experienced anytime during the lifespan. The LEC-5 presents respondents with 16 potentially traumatic events (e.g., natural disaster, combat, sexual assault) and includes an additional item that assess 'other' potentially traumatic events not listed. In the current study, respondents were asked to indicate (via check mark) whether each listed event "has happened to you at some point in your life." Two items from the LEC-5 (i.e., 'exposure to toxic substance' and 'severe human suffering') were removed and two items were added (i.e., 'childhood physical abuse' and 'childhood sexual abuse'). These modifications were instituted to reduce potential for false-positive reports (e.g., endorsement of 'exposure to toxic substance' by patients with psychotic-spectrum psychopathology) and to add a childhood time-frame for endorsement of sexual or physical abuse/assault. In the

current study, the LEC-5 was used to determine (1) trauma exposure, an inclusionary criterion for the study, and (2) the number of traumatic life event types each participant experienced, a covariate.

2.2.4. Pittsburgh Sleep Quality Index (PSQI; [46])

The PSQI is a 19-item self-report inventory composed of 15 multiple-choice items and four write-in items that address 7 components of sleep —subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction in the past month. Subjective sleep quality is based on the respondent's overall rating of sleep quality. Sleep latency is determined by the self-reported length of time (in minutes) for sleep to commence. Sleep duration refers to the number of hours of actual sleep accounting for the number of hours that the respondent is in bed. Habitual sleep efficiency refers to the percentage of time in bed that one is asleep. Sleep disturbances are determined by the presence of nighttime and morning wakings, presence of bad dreams, and sleep discomfort (e.g., feelings of pain, being cold/hot). Daytime dysfunction is assessed based on difficulties staying awake while driving, engaging in social activities, or accomplishing tasks. Global scores range from 0 to 21, with higher scores indicating greater SRPs and overall poorer sleep. Use of sleep medications was not included as an index of sleep problems in the current study. The PSQI demonstrates good psychometric properties, including good internal consistency, convergent validity, and discriminant validity with established measures of SRPs [47–49]. For the current study, Cronbach's $\alpha = 0.57$ and 0.62 for Black and White participants, respectively.

2.2.5. Beck Scale for Suicide Ideation (BSS; [50])

The BSS is a 21-item self-report questionnaire that measures the severity of an individual's suicide ideation or desire to die [51]. The first five items are used as a screener to reduce administration time for participants who reported no or very minimal suicide ideation; the remaining items are used to assess suicide thoughts and plans [51]. Using a 3-point scale, the BSS assesses the most accurate statement for the intensity of suicide ideation in the past week (e.g., "I have no wish to live"). The BSS has demonstrated high internal consistency (α =0.96) and strong test-retest reliability over a 1-week period ($r = 0.88$) in psychiatric inpatient populations [52,53]. In the current study, the BSS demonstrated good internal consistency (Cronbach $\alpha = 0.89$ for both Black and White participants). The first 5 BSS items, which were administered to all participants, were utilized as an index of self-reported suicide ideation severity, an outcome variable.

2.3. Procedure

All individuals assigned to one unit in an acute-care psychiatric inpatient hospital were screened for a history of exposure to trauma using the LEC-5 within 24 h of admission. Within five days of admission, study staff approached individuals who endorsed at least one trauma for potential participation. Individuals who were willing to participate provided informed verbal and written consent. Participants were then administered the MMSE and completed a self-report packet, which included the questionnaires used for the current study. Participation was completely voluntary; no financial compensation was provided. The study was approved by all relevant institutional review boards.

2.4. Data analytic plan

All analyses were conducted in IBM SPSS 25.0. First, descriptive statistics and bivariate correlations were conducted; correlations were examined separately by race (i.e., Black, White). Second, to assess race group differences in self-reported SRPs, a multivariate analysis of covariance (MANCOVA) was conducted. In this analysis, race was the predictor variable and PSQI subscale scores for subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, and daytime dysfunction were criterion variables with age, sex, and education level entered as covariates. Third, to assess which SRPs, if any, were associated with significantly increased odds of a suicide-related versus non-suicide-related psychiatric admission, we conducted adjusted logistic regression analyses controlling for other SRPs, appropriate demographics variables, mean number of traumatic events, and number of previous suicide attempts. Missing data were minimal (<4%) and handled using a mean imputation procedure (Missing data module in SPSS v. 25; IBM Corp., USA); logistical regression analyses and hierarchical regression analyses were conducted using imputed data. To build a parsimonious model, we included only sociodemographic covariates and sleep problems that were significantly associated with psychiatric admission at $p < .15$ (cf. [54,55]) for either Black or White study participants. Thus, sleep quality, sleep duration, sleep efficiency and daytime dysfunction were included in the models with age, sex, level of education, marital status, and number of previous attempts as covariates. Fourth, to assess which specific SRPs were associated with thoughts of suicide for Black and White participants admitted for psychiatric care, we conducted hierarchical multiple regression analyses via the parsimonious approach with the four PSQI subscale scores as the independent variables and BSS total scores as the dependent variable, controlling for sociodemographic variables.

3. Results

3.1. Preliminary analyses

Descriptive statistics and intercorrelations among all measured variables are presented separately by race in Table 2. Only data for 92 White and 80 Black study participants were included in the current analyses. Data for participants who identified as Latinx ($n = 32$), Asian ($n = 4$) or native Hawaiian/ Pacific Islander ($n = 1$) were not included. Mean age for the sample was 34.62 years (SD = 11.76) and 35.76 years (SD = 11.84) for Black and White participants, respectively. Among Black participants, suicide-related psychiatric admission was related to overall SRPs ($r = 0.37$, $p < .05$) and also to self-reported suicide ideation $r = 0.30$, $p < .05$). Though the ratio of participants who reported having had multiple previous suicide attempt was significantly higher for Black participants (38% compared to 21% of White participants), the groups were not otherwise significantly different, sociodemographically (see Table 1).

3.2. Sleep-related problems among Black and White inpatients

See Table 3 for a summary of group comparisons of SRPs. A significant main effect was documented for one of the six measured SRPs such that, relative to White trauma-exposed participants, Black participants reported significantly greater delay in sleep onset/latency. There were no other statistically significant differences in other PSQI component scores.

3.3. Associations for SRPs and suicide-related psychiatric admission among Black and White inpatients

See Table 4 for odds ratios for suicide-related versus non-suicide-related psychiatric admission for Black and White adults admitted for acute-care psychiatric hospitalization. For Black adults, results showed that daytime dysfunction was associated with an approximately 4-fold (95% C.I. [1.29.42, 14.486.21]) increased odds of a suicide-related psychiatric admission versus non-suicide-related admission. Sleep quality was associated with a 3.6 odds increase (95% CI [1.01, 13.13]) in suicide-related psychiatric admission. For White participants, only sleep quality was associated with a two-fold increase in suicide-related psychiatric admission (95% CI [0.00, 4.41]), after controlling for age, sex, education level, marital status, and number of previous suicide attempts.

Table 2
Summary of Intercorrelations, Means, and SDs for the suicide and sleep-related problem scores by race group.

Measures	1	2	3	4	5	6	7	8	9	M	SD
1. Sex	–	−0.25*	−0.02	−0.11	0.02	0.20#	−0.01	−0.27*	0.03		
2. Age	0.04	–	0.02	0.23*	−0.14	0.16	0.01	0.06	0.21	34.62	11.77
3. Education	−0.10	0.19#	–		−0.13	0.03	0.09	0.02	0.16	6.68	1.84
4. Marriage	0.13	0.36**	0.10	–	−0.01	0.06	0.09	0.06	0.27*		
5. LEC-5	0.14	0.08	−0.12	0.13	–	0.06	−0.20#	0.01	0.01	6.67	5.57
6. Prior attempts	0.18#	0.16	0.03	0.06	0.17	–	0.11	0.01	0.18	188.02	392.04
7. Suicide Admission	−0.01	0.01	0.09	0.09	0.10	0.10	–	0.26*	0.37*		
8. BSS scores	−0.27*	0.06	0.02	0.06	0.23*	0.23*	0.30**	–	0.06	1.79	2.67
9. PSQI	0.03	0.21	0.16	0.27*	0.24#	0.27*	0.14	0.06	–	10.13	3.99
M		35.76	7.2		6.14	87.46		1.67	10.22		
SD		11.84	1.82		3.43	282.85		2.54	4.70		

Note. Intercorrelations for Black participants (n = 80) are presented above the diagonal; intercorrelations for White participants (n = 92) are presented below the diagonal. Means and standard deviations for Black participants are noted in the vertical columns; means and SDs for White participants are indicated in the horizontal rows. For all scales, higher scores are indicative of more extreme responding in the direction of the construct assessed. LEC-5 = total number of traumatic events. Suicide admission = suicide as precipitant to psychiatric admission dummy coded as 1 = yes, 0 = no. BSS = Beck Suicide Scale, sum of first five items; PSQI = Pittsburg Sleep Quality Index total score. Sex is coded as 0 = male; 1 = female.
# $p < .10$.
* $p < .05$.
** $p < .0$.

3.4. Associations for SRPs and suicide ideation among Black and White inpatients

Please see Table 5 for a summary of associations between SRPs and suicide ideation among Black and White study participants. Among Black participants, the overall model was not statistically significant ($[F\ (8, 191)] = 2.23$, $p = .051$) but accounted for 18% of variance in BSS scores. Sleep duration ($t = 1.94$, $p < .05$), but none of the other sleep indicators, were associated with thoughts of suicide. For White participants, the overall model was not significant ($[F\ (8, 393)] = 1.53$, $p = .166$).

4. Discussion

The overall aim of the current study was to examine SRPs and suicide related behavior and ideation in a clinical sample of Black and White trauma-exposed adults. Black adults are overrepresented among those who experience trauma and violence, but less likely to receive trauma-related care [56]. Results of this preliminary study revealed that Black adults experienced more delayed sleep onset compared to White adults though not significantly more SRPs in other domains (e.g., quality, efficiency, disturbance, etc.). These findings are consistent with other studies that have found some race group differences in SRPs. However, racial disparities in sleep may be less pronounced in a trauma-exposed psychiatric population.

SRPs were associated with significantly greater odds of suicide-related psychiatric admission for both Black and White adults in the current sample. For Black adults, daytime dysfunction, including difficulties staying awake for activities such as eating, driving, and engaging in social activities was associated with a 4-fold greater risk for suicide crisis. Since suicide vulnerability emerges in response to life stress and hopelessness, daytime dysfunction may exacerbate (or be an added artifact of) ongoing stress, though it is less clear why Black participants could be affected more than White participants. Poorer subjective sleep quality was related to greater odds for suicide-related psychiatric admission for Black and White psychiatric inpatients in the current study. Sleep quality was associated with a more than doubled risk for suicide-related psychiatric admission for White and tripled risk for Black study participants. Intervention studies may target sleep quality to mitigate suicide risk across racial groups. However, only shortened sleep duration was related to self-reported thoughts of suicide and only for Black participants in the current study. Inadequate sleep duration can escalate daytime dysfunction though perhaps not similarly across racial groups. Future studies should examine the temporal pathway for SRPs, daytime dysfunction and suicide-related stressors across racial groups. Timeline follow-back methodology, as one approach, provides insight to the 24–48 h that precede suicide attempt [57]. Studies that specifically examine sleep duration and dysfunction could shed light on the warning signs for suicide crisis that are relevant to underserved populations.

Table 3
Multiple Analysis of Covariance (MANCOVA) for Sleep Measures.

Measure	*df*	*F*	*Mean* (SE)	
			Black	White
Sleep quality	1	0.03	1.66 (0.06)	1.70 (0.05)
Sleep latency	1	9.21**	1.89 (0.06)	1.28 (0.05)
Sleep duration	1	2.24	1.85 (0.07)	1.54 (0.06)
Sleep efficiency	1	0.69	1.22 (0.07)	1.03 (0.07)
Sleep disturbance	1	0.38	0.97 (0.06)	1.01 (0.06)
Daytime dysfunction	1	0.00	1.23 (0.06)	1.33 (0.05)

Note. Covariates: age, sex, education, number of previous suicide attempts
F ratios were generated from the Wilks' Lambda statistic.
** $p < .01$

Table 4
Odds ratios for suicide versus non-suicide related psychiatric admission for Black and White adults admitted for acute care.

	Covariates and predictor variables	AOR	95% CI	*p*
Black				
1.	Age	1.05*	0.98–1.12	0.19
	Sex	1.51	0.39–5.90	0.55
	Level of education	0.90	0.64–1.25	0.52
	Marital status	1.92	0.72–5.10	0.19
	Previous attempts	0.99*	0.99–1.00	0.03
2.	Sleep quality	3.64*	1.01–13.13	0.04
	Sleep duration	1.01	0.37–2.74	0.98
	Sleep efficiency	0.84	0.40–1.80	0.66
	Daytime dysfunction	4.32*	1.29–14.48	0.02
White				
1.	Age	0.99	0.95–1.04	0.89
	Sex	0.78	0.27–2.25	0.64
	Level of education	1.07	0.82–1.40	0.63
	Marital status	1.22	0.78–1.91	0.39
	Previous attempts	1.00	1.00–1.00	0.44
2.	Sleep quality	2.10*	1.00–4.41	0.04
	Sleep duration	0.99	0.55–1.79	0.99
	Sleep efficiency	0.61#	0.35–1.06	0.07
	Daytime dysfunction	1.64	0.86–3.15	0.13

* $p < .05$.
# $p < .10$.

Table 5
Hierarchical Multiple Regression Analyses Predicting Beck Suicide Scale Scores by Race Group.

Step and predictor variables		B	*t*	*SE*	*p*
Black					
1.	Age	0.04	1.16	0.03	0.25
	Sex	−0.79	−1.06	0.71	0.29
	Level of education	0.25	1.15	0.17	0.15
	Marital status	−0.27	−0.71	0.38	0.48
	Previous attempts	−0.00[#]	−1.68	0.00	0.09
2.	Sleep quality	0.40	0.89	0.45	0.37
	Sleep duration	0.73[*]	1.94	0.37	0.05
	Sleep efficiency	−0.31	−1.2	0.25	0.23
	Daytime dysfunction	0.12	0.34	0.36	0.73
			Adj. R square = 0.176		=0.051
White					
1.	Age	0.03	0.92	0.03	0.36
	Sex	−1.56[*]	−2.28	0.69	0.02
	Level of education	−0.07	−0.43	0.17	0.67
	Marital status	0.21	0.74	0.28	0.46
	Previous attempts	0.00	0.50	0.00	0.62
2.	Sleep quality	0.71[#]	1.76	0.40	0.08
	Sleep duration	0.08	0.24	0.33	0.81
	Sleep efficiency	−0.45	−1.58	0.28	0.11
	Daytime dysfunction	0.12	0.34	0.36	0.73
			Adj. R square = 0.074		=0.162

[*] $p < .05$.
[#] $p < .10$.

The present study provides preliminary insight into the adverse effects of poor sleep quality, short duration of sleep, and sleep-related daytime dysfunction on suicide-related behavior for Black and White adults in psychiatric care. Some limitations, however, should be noted. First, the study relied on a single, self-report measure of sleep. Objective sleep measures, such as polysomnography, actigraphy, or EEG, can provide more valid indicators of sleep parameters particularly for persons who experience significant psychiatric symptomatology. While subjective reports of sleep provide important insight to sleep quality, some researchers have noted that objective measures of sleep can provide better understanding of overall impairment. Second, the internal consistency of the PSQI fell below 0.70 for both Black and White patients. Though other studies have reported similar reliability for the PSQI [58], levels that fall below 0.70 suggest that the scale items may be less cohesive in a high risk clinical population compared to other populations. Third, the study utilized a cross-sectional design; therefore, directionality of effects cannot be inferred. Longitudinal studies are necessary to establish the temporality of observed associations. Finally, the study presents findings for a relatively rare clinical population and includes a large proportion of persons who were admitted for suicide-related problems and reported a history of trauma. However, the exact nature of the suicide-related crisis is unknown and may vary from serious threats of self-harm to medically serious suicide attempt. The study findings may also have limited generalizability for persons who do not have a history of traumatic life events. Future controlled studies may identify specific SRPs (including nightmares and insomnia) for those who engage in clearly defined (e.g., medically serious suicide attempts, planning, etc.).

The overall aim of the current study was to assess SRPs and suicide-related behavior for high-risk Black and White adults admitted for acute psychiatric care. To our knowledge, this is the first study to examine SRPs related to psychiatric admission for a trauma-exposed, clinical population. Importantly, we attempted to disaggregate patterns of risk for a severe psychiatric sample of Black and White men and women. Though religiosity and other factors have been suggested to mitigate the impact of other risk factors for Black Americans, suicide remains a leading cause of death [59]. Sleep, however, is a modifiable risk factor that can be readily assessed and also amenable to evidence-based intervention [60]. Future studies should assess potential causal pathways for which SRPs and traumatic stress contribute to suicide risk across racial groups. The preliminary findings are important in the context of developing specific directions for future hypothesis testing and developing culturally inclusive approaches to assessing suicide risk and more imminent warning signs.

References

[1] Drapeau CW, McIntosh JL. U.S.A. suicide 2017: Official final data. Washington, D.C: American Association of Suicidology. Available from: http://www.suicidology.org; 2018, December 10.
[2] Ting SA, Sullivan AF, Boudreaux ED, Miller I, Camargo Jr CA. Trends in U.S. emergency department visits for attempted suicide and self-inflicted injury, 1993–2008. Gen Hosp Psychiatry 2012;34:557–65.
[3] Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, et al. Risk factors for suicidal thoughts and behaviors: a meta-analysis of 50 years of research. Psychol Bull 2017;143:187.
[4] Busch KA, Fawcett J, Jacobs DG. Clinical correlates of inpatient suicide. J Clin Psychiatry 2003;64:14–9.
[5] Abuse Substance, Administration Mental Health Services. (SAMHSA). Warning signs of suicide. Retrieved March 2017:19https://www.nimh.nih.gov/health/topics/suicide-prevention/suicide-prevention-studies/warning-signs-of-suicide.html.
[6] Cornette MM, Walker RL. Warning signs for suicide. In: Wenzel, editor. The sage encyclopedia of abnormal and clinical psychology. Thousand Oaks, CA: Sage Publications; 2016.
[7] Rudd MD, Berman AL, Joiner Jr TE, Nock MK, Silverman MM, Mandrusiak M, et al. Warning signs for suicide: theory, research, and clinical applications. Suicide Life Threat Behav 2006;36:255–62.
[8] Cohen M, Menefee L, Doghramji K, Anderson W, Frank E. Sleep in chronic pain: problems and treatments. Int Rev Psychiatry 2000;12:115–27.
[9] Cho HJ, Seeman TE, Kiefe CI, Lauderdale DS, Irwin MR. Sleep disturbance and longitudinal risk of inflammation: moderating influences of social integration and social isolation in the Coronary Artery Risk Development in Young Adults (CARDIA) study. Brain Behav and Immun 2015;46:319–26.
[10] Orff HJ, Jak AJ, Gregory AM, Schiehser DM, Drummond SP, Lohr Twamley EW. Sleep disturbance, psychiatric, and cognitive functioning in veterans with mild to moderate traumatic brain injury. J Sleep Disord Treat Care 2016;4:1–6.
[11] Drapeau CW, Nadorff MR. Suicidality in sleep disorders: prevalence, impact. and management strategies Nat Sci Sleep 2017;9:213–26.
[12] Chu C, Hom MA, Rogers ML, Stanley IH, Ringer-Moberg FB, Podlogar MC, et al. Insomnia and suicide-related behaviors: a multi-study investigation of thwarted belongingness as a distinct explanatory factor. J Affect Disord 2017;208:153–62.
[13] Hom MA, Chu C, Schneider ME, Lim IC, Hirsch JK, Gutierrez PM, et al. Thwarted belongingness as an explanatory link between insomnia symptoms and suicidal ideation: findings from three samples of military service members and veterans. J Affect Disord 2017;209:114–23.
[14] McCall WV, Batson N, Webster M, Case LD, Joshi I, Derreberry T, et al. Nightmares and dysfunctional beliefs about sleep mediate the effect of insomnia symptoms on suicidal ideation. J Clin Sleep Med 2013;9:135–40.
[15] Woosley JA, Lichstein KL, Taylor DJ, Riedel BW, Bush AJ. Hopelessness mediates the relation between insomnia and suicidal ideation. J Clin Sleep Med 2014;10:1223–30.
[16] Ribeiro JD, Pease JL, Gutierrez PM, Silva D, Bernert RA, Rudd MD, et al. Sleep problems outperform depression and hopelessness as cross-sectional and longitudinal predictors of suicidal ideation and behavior in young adults in the military. J Affect Disord 2012;136:743–50.
[17] Chellappa SL, Araújo JF. Excessive daytime sleepiness in patients with depressive disorder. Rev Bras Psiquiatr 2006;28:126–9.
[18] Michaels MS, Balthrop T, Nadorff MR, Joiner TE. Total sleep time as a predictor of suicidal behaviour. J Sleep Res 2017;26:732–8.
[19] Goodwin RD, Marusic A. Association between short sleep and suicidal ideation and suicide attempt among adults in the general population. Sleep 2008;31:1097–101.
[20] Glenn CR, Cha CB, Kleiman EM, Nock MK. Understanding suicide risk within the Research Domain Criteria (RDoC) framework: insights, challenges, and future research considerations. Clinl Psychol Sci 2017;5:568–92.
[21] Littlewood D, Kyle SD, Pratt D, Peters S, Gooding P. Examining the role of psychological factors in the relationship between sleep problems and suicide. Clin Psychol Rev 2017;54:1–16.
[22] Chen X, Wang R, Zee P, Lutsey PL, Javaheri S, Alcántara C, et al. Racial/ethnic differences in sleep disturbances: the Multi-Ethnic Study of Atherosclerosis (MESA). Sleep 2015;38:877–88.
[23] National Center on Sleep Disorders Research: National Institutes of Health sleep disorders research plan. Bethesda, MD: National Institutes of Health 2011.
[24] Petrov ME, Lichstein KL. Differences in sleep between black and white adults: an update and future directions. Sleep Med 2016;18:74–81.
[25] Abe K, Mertz KJ, Powell KE, Hanzlick RL. Characteristics of black and white suicide decedents in Fulton County, Georgia, 1988–2002. Am J Public Health 2006;96:1794–8.
[26] Garlow SJ, Purselle D, Heninger M. Ethnic differences in patterns of suicide across the life cycle. Am J Psychiatry 2005;162:319–23.
[27] Morrison LL, Downey DL. Racial differences in self-disclosure of suicidal ideation and reasons for living: implications for training. Cultur Divers Ethnic Minor Psychol 2000;6:374.
[28] Hale L, Do DP. Racial differences in self-reports of sleep duration in a population-based study. Sleep 2007;30:1096–103.

[29] Nunes J, Casimir GJ, Hans von Gizycki MA, Brown CD, McFarlane SI. Sleep duration among black and white Americans: results of the National Health Interview Survey. J Natl Med Assoc 2008;100:317.
[30] Knutson KL, Van Cauter E, Rathouz PJ, DeLeire T, Lauderdale DS. Trends in the prevalence of short sleepers in the USA: 1975–2006. Sleep 2010;33:37–45.
[31] Song Y, Ancoli-Israel S, Lewis CE, Redline S, Harrison SL, Stone KL. The association of race/ethnicity with objectively measured sleep characteristics in older men. Behav Sleep Med 2012;10:54–69.
[32] Ruiter ME, DeCoster J, Jacobs L, Lichstein KL. Normal sleep in African-Americans and Caucasian-Americans: a meta-analysis. Sleep Med 2011;12:209–14.
[33] Hall MH, Matthews KA, Kravitz HM, Gold EB, Buysse DJ, Bromberger JT, et al. Race and financial strain are independent correlates of sleep in midlife women: the SWAN sleep study. Sleep 2009;32:73–82.
[34] Holdaway AS, Luebbe AM, Becker SP. Rumination in relation to suicide risk, ideation, and attempts: exacerbation by poor sleep quality? J Affect Disord 2018;236:6–13.
[35] Hom MA, Hames JL, Bodell LP, Buchman-Schmitt JM, Chu C, Rogers ML, et al. Investigating insomnia as a cross-sectional and longitudinal predictor of loneliness: findings from six samples. Psychiatry Res 2017;253:116–28.
[36] Ongeri L, McCulloch CE, Neylan TC, Bukusi E, Macfarlane SB, Othieno, et al. Suicidality and associated risk factors in outpatients attending a general medical facility in rural Kenya. J Affect Disord 2018;225:413–21.
[37] Gelaye B, Barrios YV, Zhong QY, Rondon MB, Borba CP, Sánchez SE, et al. Association of poor subjective sleep quality with suicidal ideation among pregnant Peruvian women. Gen Hosp Psychiatry 2015;37:441–7.
[38] Gunnell D, Chang SS, Tsai MK, Tsao CK, Wen CP. Sleep and suicide: an analysis of a cohort of 394,000 Taiwanese adults. Soc Psychiatry and Psychiatr Epidemiol 2013;48:1457–65.
[39] Doshi A, Boudreaux ED, Wang N, Pelletier AJ, Carmargo CA. National study of US emergency department visits for attempted suicide and self-inflicted injury. Ann Emerg Med 2005;46:369–75.
[40] Berg MT. Accounting for racial disparities in the nature of violent victimization. J Quant Criminol Clin Psychol Sci 2014;30:629–50.
[41] Harrell E. Black victims of violent crime. Bureau of Justice Statistics Special Report, United States Department of Justice, Office of Justice Programs. Washington, DC; 2007. p. 1–12.
[42] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. . 5th ed.Washington, DC: Author; 2013.
[43] Folstein M, Folsten S, McHugh P. Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–98.
[44] Tombaugh TN, McIntyre NJ. The mini-mental state examination: a comprehensive review. J Am Geriatr Soc 1992;40:922–35.
[45] Weathers F, Litz B, Keane T, Palmieri T, Marx BP, Schnurr P. The PTSD Checklist for DSM-5 (PCL-5). Scale available from the National Center for PTSD at www.ptsd.va.gov 2013.
[46] Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193–213.
[47] Carpenter JS, Andrykowski MA. Psychometric evaluation of the Pittsburgh Sleep Quality Index. J Psychosom Res 1998;45:5–13.
[48] Dietch JR, Taylor DJ, Sethi K, Kelly K, Bramoweth AD, Roane BM. Psychometric evaluation of the PSQI in US college students. J Clin Sleep Med 2016;12:1121–9.
[49] De La Vega R, Tomé-Pires C, Solé E, Racine M, Castarlenas E, Jensen MP, et al. The Pittsburgh sleep quality index: validity and factor structure in young people. Psychol Assess 2015;27:22–7.
[50] Beck AT, Steer RA. Manual for the Beck Scale for Suicide Ideation. San Antonio, TX: Psychol Corpor; 1991.
[51] Lam TH, Stewart SM, Yip PSF, Leung GM, Ho LM, Ho DSY, et al. Suicidality and cultural values among Hong Kong adolescents. Soc Sci Med 2004;58:487–98.
[52] Beck AT, Steer RA, Ranieri WF. Scale for suicide ideation: psychometric properties of a self-report version. J Clin Psychol 1988;44:499–505.
[53] Pinninti N, Steer RA, Rissmiller DJ, Nelson S, Beck AT. Use of the beck scale for suicide ideation with psychiatric inpatients diagnosed with schizophrenia, schizoaffective, or bipolar disorders. Behav Res Ther 2002;40:1071–9.
[54] Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. Source Code for Biol and Med 2008;3:17–25.
[55] Mickey J, Greenland S. A study of the impact of confounder selection criteria on effect estimation. Am J Epidemiol 1989;129:125–37.
[56] Roberts AL, Gilman SE, Breslau J, Breslau N, Koenen KC. Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. Psychol Med 2011;41:71–83.
[57] Bagge CL, Littlefield AK, Glenn CR. Trajectories of affective response as warning signs for suicide attempts: an examination of the 48 hours prior to a recent suicide attempt. Clin Psychol Sci 2017;5:259–71.
[58] Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM, Colantonio A. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: a systematic review and meta-analysis. Sleep Med Rev 2016;25:52–73.
[59] Odafe MO, Talavera DC, Cheref S, Hong JH, Walker RL. Suicide in racial and ethnic minority adults: a review of the last decade. Curr Psychiatry Rev 2016;12:181–98.
[60] Ho FYY, Chan CS, Tang KNS. Cognitive-behavioral therapy for sleep disturbances in treating posttraumatic stress disorder symptoms: a meta-analysis of randomized controlled trials. Clin Psychol Rev 2016;43:90–102.