Daily and Cumulative Sleep Duration as Predictors of Suicidal Desire and Intent:

An Ecological Momentary Assessment Study

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Abstract

Objective: Shorter sleep duration has been linked to increased suicidal ideation (SI). However, limited research has examined the relationship between nightly sleep duration and short-term fluctuations in suicide risk, as well as the potential clinical utility of leveraging indices of recent (ie, past 3 days) patterns of sleep duration as a marker of acute suicide risk. This study examined associations between nightly and cumulative sleep duration and suicidal desire and intent utilizing ecological momentary assessment (EMA) in a high-risk sample of community-based adults.

Methods: A sample of 237 community-based adults with severe SI provided daily indices of self-reported sleep duration and ratings of suicidal desire and intent 6 times per day for 14 consecutive days of EMA monitoring. Data collection took place between February and May 2019.

Results: Between-person nightly sleep duration and cumulative sleep duration were negatively associated with suicidal desire (*B*s = −3.48 and −4.78) and intent (*B*s = −1.96 and −2.46). At the within-person level, nightly sleep duration was negatively related to suicidal desire (*B*s = −0.51 and −0.47) and intent. Within-person cumulative sleep duration, on the other hand, was unrelated to both suicidal desire and intent (*B*s = −0.26 and −0.09).

Conclusion: Our findings highlight the clinical utility of examining individual differences in sleep duration as a marker for suicide-related outcomes, as well as deviations from one's typical nightly sleep as a potential acute predictor of suicide-related outcomes, in addition to information about recent duration over one or more nights of sleep. Limitations and future directions are discussed.

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Suicide is a significant concern worldwide, resulting in the deaths of ~800,000 people annually.[1,2] In clinical practice, intervening early during periods of worsening suicidal ideation (SI) can prevent an individual from progressing to attempting or dying by suicide.[3] However, delivering timely interventions is a significant clinical challenge because the onset and progression of SI can occur relatively quickly, in some cases over time periods as brief as hours to days.[4,5] Thus, research identifying markers of increased proximal suicide risk, particularly risk markers that may provide enough forewarning to enact an intervention, is needed to inform clinical strategies to manage and respond to suicide risk.

Sleep duration may be a useful marker of proximal suicide risk. Meta-analytic and epidemiologic studies implicate subjectively measured (ie, sleep diary) shorter sleep duration in increased risk for the spectrum of suicide-related thoughts and behaviors, including SI, suicide attempts, and death by suicide.[6–9] These findings parallel those in studies using objective measures of sleep (ie, actigraphy),[6–9] further supporting the role of sleep duration in suicide risk. Critically, almost all of these studies have examined these associations cross-sectionally or over longer periods of time spanning months to years.[10] However, evidence suggests that sleep duration may be a relevant marker of short-term fluctuations in suicide risk as well. Shorter sleep duration measured via multiple methods has been implicated in proximal decrements in key cognitive (ie, reduced cognitive control[11]) and affective (ie, increased emotion reactivity,[12] more pronounced negative affect, and reduced emotional regulation[13]) functioning, decrements that are implicated in and thought to potentially drive suicide risk.[14–16] Indeed, experts found that shorter nightly sleep duration (measured via actigraphy and sleep diary) predicted greater severity of next-day SI, even after controlling for comorbid psychiatric symptoms, in the only study to examine this relationship to date.[17] Given the paucity of

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Clinical Points

- Shorter sleep duration has been linked to increased suicide-related outcomes, but few studies have looked at acute/short-term relations, nor has any work examined the relative utility of monitoring nightly versus cumulative indices of sleep in at-risk patients.
- Both (*a*) fewer hours of typical sleep and (*b*) decreases in sleep in an individual night compared to one's norm may be acute indicators of increased suicide risk.

research in this area, additional studies are needed to replicate these findings and better understand the nature of the relationship between sleep duration and short-term suicide risk. In particular, whether nightly sleep duration has utility in predicting other characteristics of suicide-related outcomes such as suicidal intent, which, unlike SI alone,[18] have been found to be relevant to understanding risk for suicidal behavior and suicide death,[19–21] is unclear.

However, there are important limitations to examining sleep-suicide risk effects based on nightly estimates of sleep duration. Suicide research studies typically examine the effects of past-night or past-month sleep patterns on suicide risk. However, experimental studies outside of the suicide field find that impacts of sleep loss on cognitive and affective processes implicated in suicide risk[22] compound in the presence of several nights of shorter sleep and require more time to recover from than the impacts of a loss of a single night's sleep.[11,23,24] Because of this, suicide risk may be even more pronounced for individuals with a pattern of recent shorter sleep duration. Importantly, research shows that a single night's estimate of sleep duration is a poor indicator of recent sleep patterns (ie, over- and underestimating), particularly for individuals with psychiatric concerns.[25] Given this, information about recent cumulative sleep may be a more reliable indicator of one's suicide risk. Research using polysomnography shows that using a more cumulative index of sleep duration, averaged over the course of 3 nights, can produce moderately stable within-subject estimates of recent sleep duration,[26] even among individuals with sleep disorders (ie, insomnia). This cumulative index (albeit measured via diary and actigraphy methods) has been found to predict high-impact behaviors (ie, aggression[11]) in related fields over short time periods. However, whether it has utility in predicting short-term SI, or may be a more robust predictor of SI than nightly duration, is unclear, a research question that has potential implications for how clinicians monitor sleep patterns among patients at risk for suicide.

Thus, the present study sought to address these important knowledge gaps by examining proximal associations between sleep duration and indices of suicide risk using ecological momentary assessment (EMA). We examined relationships with suicidal desire, as a metric of general suicide motivation, and suicidal intent, as an index thought to be particularly relevant for understanding the risk for subsequent suicidal behavior. We also examined the relevance of different strategies for quantifying sleep duration by including an index of single-night duration and a 3-night average of sleep duration as a short-term cumulative index of sleep duration.[11] We expected that shorter sleep duration across both indices would be associated with greater momentary suicidal desire and intent, with somewhat larger effects for desire as most risk factors in the literature are more strongly associated with ideation measures approximating suicide motivation rather than behavior.[27]

METHODS

Procedures and Participants

Prospective participants were recruited for this study via sponsored advertisements on social media platforms. Prospective participants were informed that the purpose of the study was to examine short-term risk factors for suicidal thoughts and behaviors and that all procedures were fully online and anonymous. Interested individuals were directed to a screening survey to assess past-week SI severity; adults who scored 11 or higher on the Beck Scale for Suicide Ideation[28] were eligible to participate. There were no specific exclusion criteria. Detailed information on recruitment, enrollment, and study processes, including differences between participants who completed and dropped out of the study, can be found elsewhere.[29]

Eligible participants were provided with a link and QR code to download the Ethica Data mobile application, which was used for all EMAs, on their smartphones. After providing electronic informed consent, all participants completed a baseline survey, followed by 14 days of EMA monitoring. Specifically, participants received 6 signal-contingent prompts, occurring between 9:00 AM and 9:00 PM in 6 stratified random intervals (eg, 9:00 AM–11:00 AM and 11:00 AM–1:00 PM) in participants' local time zones. During each prompt, participants were asked about their current affective, cognitive, physiological, interpersonal, and contextual states. Although participants were encouraged to complete prompts right away, they had up to an hour to complete each prompt prior to its expiration. Mental health resources, including instructions to create an individualized safety plan,[30] a list of national resources, and instructions to access emergency services if they felt unable to keep themselves safe, were presented upon completion of each prompt.

After completion of the final EMA prompt, participants were fully debriefed and compensated via email with a $20 Amazon gift card. Those who completed ≥80% of the

EMA prompts additionally received a bonus $20 gift card. All procedures were approved by the relevant university's institutional review board.

A total of 398 participants downloaded the Ethica Data application and completed the baseline survey. Of those, 237 remained enrolled for at least 3 EMA days, allowing for enough responses to be included in analyses. Thus, the final sample consisted of 237 community-based adults with severe SI. Ages ranged from 18 to 55 years (mean = 27.12, SD = 8.60), and most participants self-identified as cisgender women (61.6%), white/European American (86.9%), bisexual/pansexual (38.4%), single/never married (58.2%), and having completed at least some college (43.9%). Most participants (85.2%) reported a lifetime suicide plan, and over two-thirds (67.5%) reported at least 1 suicide attempt. A detailed composition of the sample's sociodemographic characteristics is presented in Table 1.

Participants completed an average of 12.29 days (SD = 2.92) of EMA monitoring and 4.13 prompts each day (SD = 1.82), reflecting a response rate of 87.8% for days completed and 68.8% of assessments completed each day. A total of 12,781 prompts were completed (69.1%); almost two-thirds (63.7%) of participants completed at least 80% of EMA prompts and received the compensation bonus. Sociodemographic and clinical correlates of response rates are reported elsewhere.[29,31]

Measures

Sleep duration. During the first assessment of each day, sleep duration was assessed using an item drawn from the Pittsburgh Sleep Quality Index[32]: "*Last night, how many hours of actual sleep did you get at night? (This may be different from the number of hours you spent in bed).*" Responses that were provided in units of minutes/night (eg, "420," "480") were recoded into hours/night to create a nightly sleep duration variable. Research suggests that the average of 3 consecutive nights of sleep duration is sufficient to produce moderately stable within-subject assessments of recent sleep duration.[26] Consistent with this research and procedures used in other studies of high-impact behaviors,[11] cumulative sleep duration was calculated as a rolling past-3-day average of hours slept per night.

Suicidal desire and intent. During each prompt, participants rated their current levels of suicidal desire and suicidal intent on visual analog scales ranging from 0 (no desire/intent) to 100 (definite desire/intent). Of note, the repeated assessment of suicidality has been shown to have no iatrogenic effects.[33]

Data Analytic Strategy

Descriptive statistics and bivariate correlations were first computed to examine the normality of and interrelatedness of all variables. For our outcome variables, suicidal desire and intent, an intraclass correlation coefficient, and root mean square of successive differences (RMSSD) were computed to examine the proportion of variance in each variable attributable to between-person versus within-person variance, as well as to quantify the stability in suicidal desire/intent over time. Missing data (due to uncompleted prompts) were not missing completely at random ($\chi^2_7 = 61.0$, $P < .001$)[34]; thus, missing data were addressed using multiple imputation with 5 pooled data iterations through the mice package in R.[35]

Linear mixed models, with prompts (Level 1) nested within participants (Level 2), were estimated to examine our hypotheses. Namely, 2 separate sets of models*

Table 1.
Sociodemographic Characteristics of Sample

Characteristic	Sample[a]
Gender	
Cisgender man	16 (6.8)
Cisgender woman	146 (61.6)
Transgender man	21 (8.9)
Transgender woman	4 (1.7)
Nonbinary/nonconforming	38 (16.0)
Other	2 (0.8)
Age, mean (SD), y	27.12 (8.60)
Race/ethnicity[b]	
White/European American	206 (86.9)
Black/African American	9 (3.8)
Hispanic or Latino/a	17 (7.2)
Asian	9 (3.8)
Pacific Islander	3 (1.3)
American Indian/Native American	4 (1.7)
Other	1 (0.4)
Sexual orientation	
Heterosexual/straight	79 (33.3)
Gay/lesbian/homosexual	40 (16.9)
Bisexual/pansexual	91 (38.4)
Asexual	16 (6.8)
Did not specify	—
Marital status	
Single/never married	138 (58.2)
Cohabiting	41 (17.3)
Married	37 (15.6)
Separated	10 (4.2)
Divorced	7 (3.0)
Widowed	0 (0.0)
Education	
Less than high school	9 (3.8)
High school diploma/GED	36 (15.2)
Some college	104 (43.9)
Associate's degree	22 (9.3)
Bachelor's degree	47 (19.8)
Master's degree	16 (6.8)
Doctoral/professional degree	3 (1.3)

[a]Values are presented as n (%) unless otherwise specified.
[b]Categories were not mutually exclusive.

*Given the possibility of the sleep-suicide relationship exhibiting a U-shaped curve, with both shorter and longer sleep duration associated with increased risk, we estimated a polynomial regression testing this relationship. The quadratic relationships between sleep duration and suicidal desire/intent were nonsignificant (*P*s = .648 and .645, respectively), providing no evidence of a curvilinear relationship in this sample.

Table 2.

Descriptive Statistics and Bivariate Correlations of All Variables at the Between- and Within-Person Levels[a]

Variable	1	2	3	4
1. Nightly sleep duration	—	0.52***	−0.02*	−0.02
2. Cumulative sleep duration	0.91***	—	−0.004	0.01
3. Suicidal desire	−0.25***	−0.29***	—	0.52***
4. Suicidal intent	−0.20***	−0.21***	0.82***	—
Mean	6.52	6.50	28.94	19.99
SD	2.05	1.42	30.58	26.77
Range	0–15	1.33–12.67	0–100	0–100
Skewness	−0.17	−0.04	0.86	1.61
Kurtosis	1.42	0.65	−0.66	1.65
ICC	0.23	0.53	0.73	0.84
RMSSD	2.30	0.81	12.50	8.04

[a]Within-person correlations (N = 12,781) are presented above the diagonal, and between-person correlations (N = 237) are presented below the diagonal.
*P < .05; ***P < .001.
Abbreviations: ICC = intraclass correlation coefficient, RMSSD = root mean square of successive differences.

were estimated to examine relationships between (1) individual-day sleep duration and suicidal desire/intent and (2) cumulative average sleep duration (ie, past 3 days) and suicidal desire/intent. Both sets of models incorporated a random intercept and random slope for sleep duration[†]. Sleep duration was included at both the within-person and between-person levels to disaggregate within- and between-person effects[36] by applying group mean-centering. Specifically, between-person (ie, Level 2) sleep duration was reflected by participant-specific means (ie, each participant's unique mean score averaged across all assessments in the study period), whereas within-person (ie, Level 1) sleep duration was reflected by time-specific deviations around each participant-specific mean.[36,37] Age and gender were included as covariates in each model. All analyses were conducted in R using the *lme4* and *lmerTest* packages.[38,39]

RESULTS

Descriptive statistics and bivariate correlations (at the between-person and within-person levels) are presented in Table 2. Trajectories of all variables across participants over time can be visualized in Figure 1. On average, participants reported sleeping an average of 6.52 hours per night (range, 0–15 hours). Likewise, average cumulative sleep durations were 6.50 hours (SD = 1.42, range, 1.33–12.67). Regarding bivariate associations, nightly sleep duration and cumulative sleep duration were each negatively related to suicidal desire and suicidal intent at the between-person level (Ps < .001), and nightly sleep duration was negatively related to suicidal desire at the within-person level (P = .018). Cumulative sleep duration, on the other hand, was unrelated to suicidal desire at the within-person level (P = .648), and neither nightly sleep duration (P = .053) nor cumulative sleep duration (P = .338) was related to suicidal intent at the within-person level.

In multivariate linear mixed modeling analyses (see Tables 3 and 4), controlling for age and gender, between-person nightly sleep duration and cumulative sleep duration were each negatively related to both suicidal desire and intent. At the within-person level, on the other hand, nightly sleep duration was significantly negatively related to both suicidal desire and intent (Table 3), but cumulative sleep duration was not (Table 4).

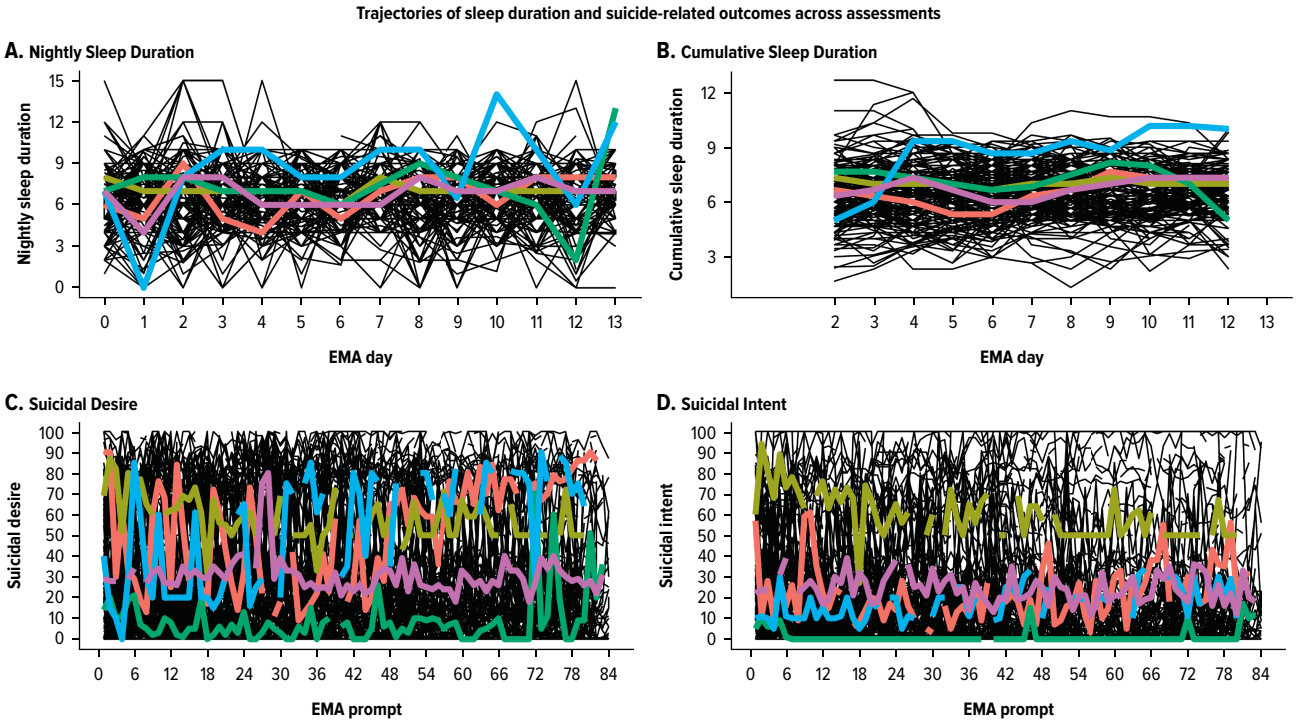
DISCUSSION

Although sleep duration has been implicated in suicide risk, its utility as a marker of short-term risk is not well understood. This study was the first to examine associations between sleep duration and indices of momentary ideation implicated in suicide motivation (ie, desire) and behavior (ie, intent). Consistent with expectations, we found that individuals who slept fewer hours, on average, had more severe suicidal desire and intent (between-person effects). Moreover, individuals who slept less than their own average amount of sleep during a given night experienced more severe suicidal desire and intent the following day (within-person effects). Interestingly, between-person results using a cumulative index of sleep duration largely paralleled findings of nightly sleep duration models, with slightly improved effect sizes, supporting the utility of this metric for anticipating short-term suicide risk across individuals. However, there were no

[†]We conducted sensitivity analyses to examine whether baseline levels of psychopathology (hopelessness and brooding rumination) impacted our results. After including both baseline hopelessness and rumination as covariates, the overall direction and statistical significance of our findings were unchanged in all models.

Figure 1.

Time Series Plots of Sleep Duration and Suicide-Related Outcomes Across the Course of the Study[a]



[a]All variables are in raw values to facilitate interpretation. Colored lines represent randomly selected participants to enhance the interpretability of the figure.

Table 3.

Multilevel Models Examining the Relationship Between Nightly Sleep Duration and Suicidal Desire and Intent[a]

Predictor	Suicidal desire				Suicidal intent			
Fixed effects	**B**	**SE**	**95% CI**	f^2	**B**	**SE**	**95% CI**	f^2
Intercept	24.99***	2.98	18.94 to 31.17		10.00***	2.64	4.69 to 15.26	
Sleep duration—W	−0.51***	0.12	−0.74 to −0.28	0.08	−0.47***	0.11	−0.68 to −0.26	0.10
Sleep duration—B	−3.48***	1.03	−5.52 to −1.45	0.05	−1.96*	0.93	−3.78 to −0.13	0.02
Age	0.26*	0.10	0.03 to 0.47	0.05	0.47***	0.10	0.26 to 0.66	0.06
Cisgender man	10.44***	2.73	5.07 to 15.81	0.01	1.78	2.31	−2.75 to 6.31	0.0003
Transgender man	−5.27*	2.53	−10.23 to −0.29	0.004	−1.85	2.12	−6.01 to 2.34	0.001
Transgender woman	10.95	6.02	−0.93 to 22.78	0.004	17.06	5.20	6.80 to 27.28	0.01
Gender nonbinary	−2.51	1.88	−6.21 to 1.18	0.001	−1.65	1.57	−4.74 to 1.45	0.001
Other gender	−9.62	5.92	−21.27 to 2.01	0.001	−7.91	4.88	−17.49 to 1.66	0.001
Random effects	**Variance**	**SD**			**Variance**	**SD**		
Intercept	173.04***	13.15			73.43**	8.57		
Sleep slope	0.51**	0.71			0.72***	0.85		
Age slope	0.12**	0.35			0.20***	0.44		
Residual variance	593.43	24.36			389.26	19.73		

[a]Cisgender women served as the reference category for the gender variable.
*P < .05; **P < .01; ***P < .001.
Abbreviations: B = between-person effects, W = within-person effects.

Table 4.

Multilevel Models Examining Relationship Between Cumulative Sleep Duration and Suicidal Desire and Intent[a]

Predictor	Suicidal desire				Suicidal intent			
Fixed effects	**B**	**SE**	**95% CI**	f^2	**B**	**SE**	**95% CI**	f^2
Intercept	26.34***	3.39	19.41 to 33.42		7.62*	2.96	1.71 to 13.50	
Sleep duration—W	−0.26	0.24	−0.73 to 0.20	0.003	−0.09	0.20	−0.47 to 0.30	0.001
Sleep duration—B	−4.78***	1.07	−6.91 to −2.66	0.08	−2.46*	0.97	−4.37 to −0.55	0.03
Age	0.14	0.11	−0.10 to 0.37	0.01	0.46***	0.10	0.25 to 0.66	0.07
Cisgender man	9.43**	2.93	3.68 to 15.17	0.01	1.63	2.47	−3.23 to 6.48	0.0003
Transgender man	−8.40**	2.74	−13.78 to −3.01	0.01	−2.57	2.31	−7.10 to 2.00	0.001
Transgender woman	24.41**	7.43	9.80 to 39.10	0.03	28.28***	6.54	15.40 to 41.16	0.03
Gender nonbinary	−1.57	2.07	−5.65 to 2.49	0.001	−1.41	1.74	−4.82 to 2.00	0.0005
Other gender	−9.55	6.29	−21.93 to 2.80	0.001	−8.70	5.20	−18.91 to 1.51	0.001
Random effects	**Variance**	**SD**			**Variance**	**SD**		
Intercept	139.72**	11.82			76.32*	8.74		
Sleep slope	1.20**	1.09			1.03**	1.02		
Age slope	0.14**	0.37			0.17***	0.41		
Residual variance	583.36	24.15			380.20	19.50		

[a]Cisgender women served as the reference category for the gender variable.
*P < .05; **P < .01; ***P < .001.
Abbreviations: B = between-person effects, W = within-person effects.

within-person effects for this index. These results have important implications for clinical monitoring of suicide risk and future research in this area.

Nightly Sleep Duration and Suicide Risk

A primary goal of this study was to examine associations of nightly sleep duration with suicide risk indices. We found that when participants slept less than their own average sleep duration (ie, within-person effects), they reported more severe levels of suicidal desire. Moreover, these effects were much more pronounced when they slept less on average than the overall sample (ie, between-person effects). These results are consistent with findings from Littlewood et al[17] that link shorter nightly sleep duration with more severe next-day SI. Shorter sleep can impair functioning[11,13] and reduce the energy available to manage distress,[40] which could increase motivation for suicide under conditions of shorter sleep duration.[41] However, additional research examining potential mechanisms of this relationship is needed to better explicate the nature of this relationship.

Results examining the relationship between nightly duration and suicidal intent were consistent with findings of suicidal desire analyses. Specifically, we found that individuals with shorter nightly duration compared to the average sleep duration of the sample, as well to their own average sleep duration, reported greater momentary suicidal intent. Overall, these results implicate nightly sleep duration in both motivationally and behaviorally relevant characteristics of momentary suicide risk. Taken together with the broader literature, shorter nightly duration appears to be associated with greater suicide risk in general over both broad (ie, months to years[10]) and proximal (ie, days) timescales. Nevertheless, additional studies are needed to examine other metrics of suicide risk beyond intent that may be particularly relevant for behavior (eg, urges[42]) and to directly measure proximal associations with suicidal behavior to truly ascertain whether these effects are largely due to desire/intent, rather than behavior.[43]

Cumulative Sleep Duration and Suicide Risk

A second goal was to examine the utility of using a cumulative metric of recent sleep duration to predict momentary suicidal desire/intent. Results were partially consistent with those obtained in nightly sleep duration analyses. Specifically, we found that shorter cumulative sleep duration was associated with increased momentary suicidal desire and intent, but interestingly, only at the between-person level. These effects were also marginally larger than those observed for nightly sleep duration, despite there being fewer cumulative than nightly observations available for models, which may reflect compounding effects of sleep loss on suicide risk. These findings are consistent with other literature indicating the predictive utility of cumulative sleep metrics in understanding risk for high-impact urges and behaviors[11] and provide the first support that recent cumulative sleep duration is a marker of suicide risk, but primarily for identifying risk when comparing the sleep patterns of one patient to another.

It is also notable that these duration–suicide risk associations were apparent despite our metric of

cumulative sleep duration being more stable than the nightly duration metric. Indeed, consistent with patterns observed in extant research,[26] the cumulative metric showed a smaller degree of variability across subsequent observations (nightly RMSSD: change of 2.3 hours on average; cumulative RMSSD: change of 0.81 hours on average) and a greater degree of within-person stability. Given the association of multiple nights of sleep duration with suicide risk, leveraging cumulative indices of duration may facilitate identifying periods of vulnerability to suicide risk with more advance notice than simply examining sleep duration the night prior and may be a factor that is more readily monitored in clinical settings to identify which patients may be at elevated risk of a suicidal crisis.

As such, these findings have several potential clinical implications. First, how a person's nightly sleep deviates from their typical sleep patterns may be an indicator of individual risk for next-day suicidal desire or intent. Second, understanding how an individual's recent sleep duration, whether nightly or over the prior several nights, benchmarks against typical sleep patterns may be a clinically useful metric of short-term suicide risk as well. Indeed, research shows that sleeping less than 6 hours per night is associated with increased suicide risk,[6] although whether this is a clinically relevant duration inflection point for monitoring short-term suicide risk remains to be examined. Third, it is possible that monitoring either index may be useful for anticipating risk. Indeed, effect sizes for the between-subjects effects of cumulative sleep loss were close in size to effects for the within-subjects effects of nightly duration in predicting both suicidal desire and intent. However, additional research conducted in more acute clinical samples is needed to replicate our findings related to cumulative sleep loss and to elucidate whether the additional variance explained by this metric is clinically meaningful in anticipating suicide risk above and beyond the variance captured by the nightly duration metric.

Limitations and Future Directions

This study has several limitations. First, we measured sleep duration via self-report, which is subject to recall bias, and individual differences in awareness, insight, and emotional well-being that can impact duration accuracy.[44] We also indexed nightly sleep duration in a metric of hours. Additional research using objective, more fine-grained, and accurate assessments of nightly sleep duration[45] is needed to confirm our findings. Second, we examined a limited number of suicide risk characteristics, and we did not examine duration-behavior relationships, which are important areas of future inquiry. Third, we did not examine other metrics of sleep (ie, chronotype, disturbances, and quality) or mechanisms of these relationships (eg, cognitive-affective or biobehavioral risk factors) that could impact vulnerability to short-term suicide risk; this is an important inquiry for future work. Fourth, our sample comprised predominantly white cisgender women recruited from the community and may differ in some ways demographically from the general population (ie, greater representation of bisexual individuals; limited representation of various degrees of educational attainment). Thus, additional studies containing more diverse samples and conducted in other settings are needed to ascertain the generalizability of our results. Fifth, due to limitations of the available data, we were unable to examine the potential contributions of comorbid somatic and/or psychiatric disorders to the relationships observed in this study. Sixth, we used a relatively short EMA period of 14 days, and this may have limited our ability to examine the effects of our cumulative sleep index. Seventh, we used a cumulative sleep index informed by polysomnography studies, and whether this index is an adequate measure of sleep stability via sleep diary methods is unknown.

CONCLUSIONS

Our study offers a novel contribution to the literature and has important clinical implications. This study was the first to examine associations between sleep duration and indices of momentary ideation implicated in suicide motivation (ie, desire) and behavior (ie, intent). We examined these relationships in a sample with a high severity of suicide risk, leveraging intensive longitudinal methods to examine these processes in ecologically valid contexts. Our results link both nightly and cumulative indices of sleep duration with increased risk of suicidal desire and intent and indicate that individuals experiencing sleep durations that are below that of their comparison group's typical durations are at particularly elevated risk of these SI features. Although additional research is needed to replicate our findings, these results implicate shorter sleep duration as an indicator of proximal suicide risk and underscore its clinical relevance.

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