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Childhood trauma as a predictor of changes in sleep quality in American Indian adults during the COVID-19 pandemic

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ABSTRACT

Background: Early life adversity associates with poor sleep in adulthood and is believed to sensitize individuals to later stressors. Infectious disease outbreaks increase psychological stress, and life events impact sleep quality. American Indians have been disproportionately affected by the COVID-19 pandemic.

Objective: Investigate whether childhood trauma predicts changes in sleep quality following onset of the pandemic and test whether pandemic stress contributes to changes in sleep.

Methods: In a sample of 210 American Indian adults (Age M (SD) = 55.09 (13.10), 59.5% female) demographics, childhood trauma and sleep quality were measured at Time 1. One month following the onset of the pandemic, psychological stress specific to the pandemic and sleep quality were measured.

Results: Using linear regression controlling for age, sex, income, and sleep quality at Time 1, childhood adversity predicted both psychological stress specific to the pandemic and changes in sleep quality from Time 1 to Time 2 ($\beta = 0.33$, $t(205) = 4.88$, $P < .001$, $\Delta R^2 = 0.10$) and ($\beta = 0.24$, $t(204) = 3.48$, $P < .001$, $\Delta R^2 = 0.05$), respectively. Mediation analyses indicated a significant indirect effect between childhood adversity and changes in sleep quality through COVID-19 stress (indirect effect [standard error, SE] = (0.03[0.01], 95% confidence interval = [0.003, 0.03]).

Conclusions: In American Indians childhood trauma predicts greater declines in sleep quality associated with the onset of the COVID-19 pandemic, in part because greater psychological stress related to COVID-19. Future work should identify factors which alleviate stress related to life events for individuals who experienced childhood trauma in order to improve health behaviors and health.

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Introduction

American Indians (AIs) experience high levels of trauma beginning in childhood.^{1,2} In response to childhood trauma, it is posited that the brain coordinates behavioral, psychological, and physiological responses to stress in order to help the individual adapt to the demands of their environment.³ To the extent that these profiles persist into adulthood, they can contribute to health-relevant behaviors and individual differences in the way that individuals respond to future stressful events.

In other racial and ethnic groups, it is well established that childhood trauma associates with poor sleep quality and increased sleep disturbances in adolescence and into adulthood.^{4–9} Given that individuals who experience childhood trauma are at increased risk to

experience psychological distress,^{10,11} one pathway that may contribute to the relationship between childhood trauma and sleep across the life-span is psychological distress. Previous work provides support for this idea, with psychological distress acting as a mediator between childhood trauma and sleep quality in adolescence.⁶ Previous work extended these findings, with childhood trauma predicting greater declines in sleep quality in response to a major life event: the transition into university life.¹² However, these relationships have not been examined in AI populations.

While research on sleep in AI populations is somewhat limited, existing data indicate that AIs experience relatively poor sleep compared to other racial and ethnic groups.^{13,14} Furthermore, in previous work, psychosocial factors including life stress predicted sleep outcomes in AI college students.¹⁵ Based on these findings and data from other racial and ethnic groups indicating that life events and stressors negatively impact sleep,^{16–18} it is possible that in AIs, childhood trauma may predict changes in sleep in response to life stressors.

On March 11, 2020, the novel coronavirus disease (COVID-19) was labeled as a pandemic; soon after, it was acknowledged as a national emergency in the United States. Previous work provides evidence

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that infectious disease outbreaks, such as the COVID-19 pandemic, elicit psychological responses.^{19–21} The uncertainty that characterizes these outbreaks can contribute to increased levels of psychological stress.^{22,23} However, as with other stressors, the nature of psychological responses to these outbreaks varies across individuals.^{24,25} While early life trauma has not previously been identified as a factor that predicts responses to infectious disease outbreaks, it has been shown to sensitize individuals to future stressful events^{26–31} and has predicted traumatic stress following a natural disaster,³² combat-related post-traumatic stress disorder,³³ and psychological responses to traumatic violent events.³⁴

Based on the described relationships between childhood trauma, psychological stress response to life stressors, and sleep quality, it was hypothesized that in the context of the COVID-19 pandemic, AI adults who reported high levels of childhood trauma may experience greater declines in sleep quality compared to AI adults with lower levels of early life trauma, and that this relationship may be mediated by higher levels of psychological stress associated with the COVID-19 pandemic.

Methods

AI participants were drawn from a previous cross-sectional survey study in AI adults. Participants for this study were recruited using a Qualtrics research panel and social media advertising targeting AI participants provided their contact information for participation in possible follow-up studies. After receiving Institutional Review Board approval, all 300 participants were contacted. Out of these participants, a sample of 210 interested AI adults was obtained. All participants provided written informed consent online before completing the surveys. Time 1 data were collected during the final week of February, 2020, and the second wave of data reported here was collected during the final week of April and the first week of May, 2020. Participants were given \$10 Amazon gift cards for the completion of surveys. To be eligible for participation, participants had to self-identify as AI and be over the age of 18, and these criteria were the same for the larger previous study from which participants were drawn from. There were no statistically significant differences in age, income, or early life trauma between those who chose to participate in this study and those who did not. Surveys administered at Time 1 included demographic questions, a measure of sleep quality, and a measure of early life trauma. Several other measures were administered at Time 1 that are not relevant to the current report, including measures of historical loss and other health behaviors. At the second wave of data collection, we repeated the measure of sleep quality, and asked about psychological stress they were experiencing related to the COVID-19 pandemic.

Measures

Early life trauma

The Risky Family Questionnaire was used to assess childhood exposure to physical, mental, and emotional abuse or neglect.³⁵ Using a 5-point Likert scale (1 = not at all and 5 = very often), participants indicated the frequency with which certain events or situations occurred during childhood (ages 5–15). Example items from this measure include, “How often would you say there was quarreling, arguing or shouting between your parents?” and “How often would you say that a parent or other adult in the household behaved violently toward a family member or visitor in your home.” Responses to each item are summed to create a total score, with higher numbers reflecting more early life trauma. The measure demonstrated good internal reliability (Cronbach $\alpha = 0.92$).

Sleep

The 19-item Pittsburgh Sleep Quality Index (PSQI) was administered.³⁶

The PSQI assesses sleep quality and sleep disturbances during the previous month. The scale consists of 19 items which are used to derive a total of 7 component scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction. The 7 component scores are summed to produce a global PSQI score. Global PSQI scores (possible range of 0–21; higher scores represent more severe sleep complaints) were computed for each participant at Time 1 and Time 2. These data provided a measure of global sleep quality before the COVID-19 pandemic and 1 month into the pandemic. While this measure does not consistently associate with polysomnography measures of sleep,³⁷ a recent study found that the PSQI associates with some objective measures of sleep quality including sleep efficiency.³⁸ Cronbach's alpha for this measure was 0.73 at Time 1 and 0.75 at Time 2.

COVID-19-specific psychological stress

As a measure of psychological stress specific to the COVID-19 pandemic, using a 7-point Likert scale from 1 = not at all stressed to 7 = extremely stressed, participants responded to the following question, “How stressed do you feel when you think about the coronavirus COVID-19 pandemic?” This measure was created specifically for this study.

Socioeconomic status

As a measure of socioeconomic status, participants reported their annual household income on a scale from 1 (US \$20,000 and below) to 6 (US \$110,000 and above).^{39,40}

Data analysis

All statistical analyses were conducted using SPSS (Version 24; IBM, Armonk, NY). We used linear regression models for the main analyses. Continuous covariates were centered prior to use in statistical models with z-scores. Early life trauma, as measured by the Risky Family Questionnaire, was modeled as a continuous predictor. The primary hypothesis was tested using a linear regression, with early life trauma predicting changes in sleep quality from Time 1 to Time 2, while controlling for age, sex, income, and sleep quality at Time 1. In a separate hierarchical linear regression model, the relationship between early life trauma and COVID-19-specific psychological stress was investigated. In each of these hierarchical regression models, the covariates were entered into Step 1, and early life trauma was entered in Step 2. Next, to test for indirect effects of early life trauma on changes in sleep quality through psychological stress related to the pandemic, a bootstrapping approach was utilized.⁴¹ A point estimate of the indirect effect was derived from the mean of 5000 estimates of the indirect pathways, and 95% confidence intervals (CIs) were computed using the cutoffs for the 2.5% highest and lowest scores of the distribution. Indirect effects were considered statistically significant when the CI did not include 0.

Results

Participants were 210 AI adults ranging in age from 30 to 99. In this sample, 59.5% of participants reported that their biological sex was female. Approximately half of the sample (52.2%) reported that their annual income was less than \$40,000, 13.7% were between \$40,001 and \$60,000, 11.2% were between \$60,001 and \$80,000, 8.8% were between \$80,001 and \$100,000, and 14.1% of the sample reported an annual income above \$100,001. Descriptive statistics are listed in Table 1, and Pearson correlations between main variables of interest are reported in Table 2.

Table 1
Descriptive statistics, N = 210.

	Range	Mean	Standard deviation
Age (Time 1)	30-99	55.09	13.10
Childhood trauma	10-50	22.58	10.72
PSQI global sleep quality (Time 1)	0-21	3.87	1.94
PSQI global sleep quality (Time 2)	0-21	6.42	3.21
COVID-19-specific stress	1-7	3.90	1.91

Table 2
Bivariate Pearson correlations between main variables of interest.

Variable	1	2	3	4	5	6
1. Age (Time 1)	-					
2. Income (Time 1)	0.06	-				
3. Childhood trauma (Time 1)	-0.23**	-0.19**	-			
4. PSQI global sleep quality (Time 1)	-0.08	-0.09	0.05	-		
5. PSQI global sleep quality (Time 2)	-0.04	-0.17*	0.23**	0.56**	-	
6. Covid-19-specific psychological stress	-0.15*	-0.10	0.31**	-0.19**	0.28**	-

PSQI, Pittsburgh Sleep Quality Index.

* Correlation significant at the 0.05 level (2-tailed).

** Correlation significant at the 0.01 level (2-tailed).

Early life trauma and changes in sleep quality

In a linear regression model with the previously described covariates, early life trauma predicted changes in global sleep quality ($\beta = 0.24$, $t(204) = 3.48$, $P < .001$, $\Delta R^2 = 0.05$), with greater reports of early life trauma associating with greater declines in global sleep quality from Time 1 to Time 2 (Table 3a).

Early life trauma and COVID-19-specific stress

In a linear regression model controlling for age, sex, income, early life trauma predicted levels of psychological stress specific to the COVID-19 pandemic ($\beta = 0.33$, $t(205) = 4.88$, $P < .001$, $\Delta R^2 = 0.10$), with greater reports of early life trauma associating with more reported psychological stress related to the pandemic (Table 3b).

Role of COVID-19-specific stress in relationship between early life trauma and changes in sleep quality

Using the previously described method,⁴¹ a significant indirect effect of early life trauma on changes in sleep quality through COVID-19-specific psychological stress was found (indirect effect (standard error, SE) = 0.02(0.01), 95% CI = [0.003, 0.32]; Fig. 1).

Table 3a
Hierarchical linear regression model with childhood trauma predicting changes in global sleep quality.

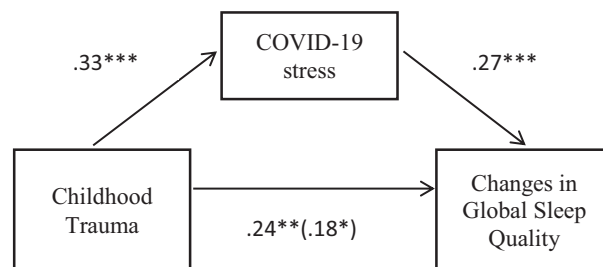
	β	P	ΔR^2	Lower CI	Upper CI
Step 1					
Age	0.07	.32		-0.01	0.04
Sex	-0.02	.74		-0.84	0.59
Income	-0.10	.18		-0.36	0.07
PSQI global sleep quality (Time 1)	-0.10	.16		-0.31	0.05
Step 2					
Childhood trauma (RFQ)	0.24	.001	0.05	0.03	0.09

PSQI, Pittsburgh Sleep Quality Index; RFQ, Risky Family Questionnaire; Step 1 includes covariates, step 2 includes the addition of the predictor childhood trauma.

Table 3b
Hierarchical linear regression model with childhood trauma predicting COVID-19-specific psychological stress.

	β	P	ΔR^2	Lower CI	Upper CI
Step 1					
Age	-0.10	.12		-0.03	0.003
Sex	0.06	.39		-0.26	0.65
Income	-0.08	.22		-0.22	0.05
Step 2					
Childhood trauma (RFQ)	0.33	.001	0.10	0.03	-0.07

RFQ, Risky Family Questionnaire; Step 1 includes covariates, step 2 includes the addition of the predictor childhood trauma.

**Fig. 1.** Standardized regression coefficients for direct and indirect effects of childhood trauma on changes in global sleep quality. The standardized regression coefficient between childhood trauma and changes in global sleep quality, controlling for COVID-19 stress, is shown in parentheses. Note: *** = $P < .001$, ** = $P < .01$, * = $P < .05$.

Discussion

To the author's knowledge, the findings reported here represent the first evidence in AIs that childhood trauma predicts changes in sleep quality associated with a life stressor, the COVID-19 pandemic. This is important since AIs are a health disparity population with poor sleep outcomes compared to other racial and ethnic groups. These findings are in line with previous work indicating that psychological stress is a pathway through which life events or stressors may negatively affect sleep quality.^{12,16} The findings also add to a growing literature documenting cross-sectional associations between childhood trauma and sleep quality in adulthood, as well as relationships between childhood trauma and changes in sleep quality associated with a life event.^{4-9,12}

The psychological stress that contributed to the relationship between early life trauma and changes in sleep quality in this study was related to the COVID-19 pandemic. Specifically, participants reported the degree of psychological stress they felt when they thought about the pandemic, and individuals who reported more trauma in childhood reported experiencing more psychological stress. In turn, higher levels of psychological stress related to the pandemic predicted greater declines in global sleep quality from the sleep quality measured before the pandemic. This pattern of findings may have particularly important implications for AIs, since, as noted previously, prior research and epidemiological data indicate that relative to other racial and ethnic groups, AIs have worse sleep outcomes. Furthermore, these findings raise the possibility that compromised sleep quality related to life stressors and psychological stress may contribute to existing disparities in incidence of mental and physical health conditions for which sleep is implicated.

These findings have important clinical implications for AIs. As a population, AIs experience significant disparities in mental and physical health and sleep health.^{1,2,13,14} Given that these data indicate that in AI adults, early life trauma predicts the degree to which life events affect sleep quality and psychological distress, clinicians should consider screening for adverse childhood experiences when targeting psychological distress and sleep disruption in AIs.

Furthermore, interventions targeting sleep in AI adults should consider using a trauma-informed approach. Finally, psychological distress related to the event contributed to the observed relationship between early life trauma and changes in sleep quality following the onset of the COVID-19 pandemic. As such, it may be particularly important to help AI adults who experienced high levels of trauma during childhood to successfully manage stress related to life events in order to avoid significant declines in sleep quality.

There are important limitations associated with this work. First, these data were collected online, which may limit the representation of AIs who do not have easy access to computers or the internet. Future work should aim to include AI individuals who do not have access to computers or internet, by distributing paper and pencil surveys to eligible participants. As noted previously, only a small percentage of the participants resided on a tribal reservation at the time of data collection. It is possible that the pattern of findings could be affected by whether AI adults are living in urban settings compared to on a tribal reservation. In the future, investigations could focus exclusively on AIs living on tribal reservations to explore this possibility. It is also possible that there were other life events and stressors which occurred between Time 1 and Time 2 which could have contributed to changes in sleep quality that were not measured. However, the relationship that was observed between childhood trauma and changes in sleep quality was mediated by psychological stress specific to the COVID-19 pandemic. The measure of childhood trauma was self-report and could be subject to recall bias. For example, analyses of these data indicate that report of childhood trauma decreases with age. It is possible that as individuals age, they are less able to recall childhood events.

Unfortunately, participants were not asked about the number of people participants resided with at the time of data collection or collect information about their sleep environment (eg, sharing bedrooms with other people). However, the PSQI measure does provide the opportunity for individuals to indicate factors that negatively impact their sleep quality, and this information is taken into account when calculating the global sleep quality measure. The PSQI measure of global sleep quality is subjective and could be affected by mood or affect at the time of survey completion. This research used the PSQI because data were collected online in order to obtain a sample of AIs from across the United States. Furthermore, the goal was to measure habitual sleep over a month-long period, which is not easily obtained with polysomnography. The PSQI is also advantageous in that the majority of sleep-related epidemiological work is based on self-reported sleep measures, which allows for interpretation of these findings relative to other research. While self-report measures do have important limitations, the PSQI measure of global sleep quality has previously been associated with psychological distress and disease outcomes.^{38,42,43} Finally, it is possible that behavioral health conditions such as a post-traumatic stress disorder diagnosis could affect patterns of stress responses to the COVID-19 pandemic. Future work should consider this possibility.

Conclusion

The COVID-19 pandemic has affected lives on a global scale; however, initial evidence indicates that AIs are disproportionately affected by the virus, in part due to higher incidence of underlying chronic conditions.^{44–47} It is well known that poor sleep is a risk factor for poor mental and physical health^{48–51} and that childhood trauma associates with increased risk for chronic mental and physical health disorders.^{52–56} These findings raise the possibility that changes in sleep quality associated with a life stressor may be one pathway through which childhood trauma may contribute to increased risk for poor health in a health disparity population. Overall, in a sample of AI adults, these findings suggest that childhood trauma may

contribute to a greater psychological stress response to life events and may increase the degree to which these life events impact sleep quality. As the COVID-19 pandemic continues, if these psychological and behavioral patterns persist, they could, over time, contribute to adverse downstream health outcomes and exacerbate existing AI health disparities. Future work should focus on identifying factors that may alleviate stress related to life events for individuals who experienced childhood trauma, in order to reduce the negative impact of trauma on health behaviors and future risk for poor health.

Conflict of interest

The author has no conflicts of interest to disclose.

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