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The Influence of PTSD, Sleep Fears, and Neighborhood Stress on Insomnia and Short Sleep Duration in Urban, Young Adult, African Americans

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Inadequate sleep has become a prominent health concern for our society. Polls conducted by the National Sleep Foundation reveal that from childhood to older adulthood 30% to 40% of Americans are obtaining levels of sleep that are outside the range of what is considered optimal for health (NSF POLL, 2003, 2004, 2005, & 2006). Inadequate sleep in the form of short sleep duration can be attributed to demanding lifestyles and personal choices. Inadequate sleep can also be related to insomnia (i.e., difficulty with sleep initiation/maintenance or obtaining unrefreshing sleep; APA, 2000).

Insomnia and short sleep duration have both been linked to decrements in daytime function and adverse health outcomes. Specifically, insomnia has been associated with mood and anxiety disorders, difficulty concentrating, reduced productivity, accidents at home and in the workplace, development of metabolic syndrome, and all-cause mortality (Basta, Chrousos, Vela-Bueno, & Vgontzas, 2007; Chien, Chen, Hsu, Su, Sung, Chen, & Lee, 2012; Daley, Morin, LeBlanc, Grégoire, Savard, & Baillargeon, 2009; Troxel, Buysse, Matthews, Kip, Strollo, Hall, Drumheller, Reis, 2010). Short sleep duration has been associated with weight gain and obesity, type 2 diabetes, hypertension, and mortality (Chien et al., 2012; Ferdinand, Pandey, Murray-Bachmann, Vincent, & McFarlane, Ogedegbe, & Jean-Louis, 2012; Hairston, Bryer-Ash, Norris, Haffner, Bowden, & Wagenknecht, 2010). Recent studies indicate synergistic adverse effects with greater risk of cognitive deficits, hypertension, and early mortality in participants who had both insomnia and short sleep duration compared to “normal” sleepers and those with insomnia and greater than 6 hours sleep duration (Fernandez-Mendoza, Calhoun, Bixler, Pejovic, Karataraki, Liao, Vela-Bueno, Ramos-Platon, Saunder, & Vgontzas, 2010; Vgontzas, Liao, Bixler, Chrousos, & Vela-Bueno, 2009).

Insomnia and short sleep may be particularly relevant to health disparities affecting African Americans. While data are mixed regarding a higher prevalence for insomnia in African Americans (Durrence and Lichstein, 2006; Lichstein et al., 2004; Rutter et al., 2007), studies have consistently demonstrated that African Americans disproportionately obtain short and long durations of sleep (Ferdinand et al., 2012; Hale and Do, 2007; Kripke et al., 2004). For example, Hale and Do (2007) found that African Americans were more likely to be short and long sleepers compared to Caucasian respondents, and these sleep disparities were accentuated among those living in the inner city compared with those living in suburban environments. Further research is necessary to determine if modifiable risk factors associated with stressful urban environments influence the development or maintenance of inadequate sleep in inner city populations.

Data from the 2010 US Census (US Census Bureau, 2011) indicate that African Americans are more likely to reside in the largest cities than other ethnic groups. African Americans also have the highest percentage of individuals living in poverty (US Census Bureau, 2011).

Likely contributors to the negative impact of low-income neighborhoods in inner cities include limited resources and exposure to trauma or stressful life events. Gillespie and colleagues (2009) studied a sample of urban, low income, primarily African American adults and found that 88% reported significant trauma over the course of their lifetime. Traumas common to low income urban environments have high risk for engendering PTSD (Goldmann et al., 2011). PTSD, a potentially debilitating condition characterized by avoidance, re-experiencing, and hypervigilance following exposure to a traumatic event (APA, 2000), features disturbed sleep and has been linked to a host of adverse outcomes. Inman and colleagues (1990) found that insomnia with PTSD in combat veterans was associated with fears of sleep, fears of the dark, and leaving the sleep environment. Similarly, there are likely to be individual and environmental factors in addition to trauma exposure and the presence of PTSD that adversely affect sleep in inner city residents. These factors include conditioned avoidance of sleep, ongoing threatening neighborhood characteristics, and lack of resources. For example, stressful neighborhood environments have been associated with unhealthy sleep-wake patterns such as greater weekday/weekend variability in total sleep time in urban adolescents (Moore, Kirchner, Drotar, Johnson, Rosen, & Redline, 2011).

Although sleep disturbances are common across the lifespan, young adulthood is a critical time period when habits are formed that either reduce or increase the risk of future adverse health outcomes. Data show that even as early as adolescence, short sleep duration puts individuals at risk for greater health burden in later adulthood (Hitze, Bosy-Westphal, Bielfeldt, Settler, Plachta-Danielzik, Pfeuffer, & Müller, 2009). Young adult African Americans may have more difficulty during this critical period, as data suggest that they take longer to fall asleep, report poorer quality of sleep, and have more light sleep and less deep sleep than Caucasian Americans in the same age range (Durrence, & Lichstein, 2006).

In summary, young adult African Americans living in stressful urban environments are likely to develop insomnia and have short sleep duration, both of which have been associated with adverse health outcomes. Yet data that identify factors associated with the development and maintenance of inadequate sleep in this high-risk population are limited. This study therefore seeks to characterize sleep patterns of young adult African Americans living in urban environments and evaluate the contributions of demographic factors, trauma exposure, PTSD, sleep fears, and neighborhood stress to insomnia and short sleep duration in this population. We hypothesized that insomnia and short sleep duration will be common among a sample of inner city African Americans and that poverty, limited education, PTSD symptom severity, fears of sleep, and stressful neighborhood environments will be independently associated with the occurrence of insomnia and short sleep duration.

Method

Participants

A sample of 454 young adult African Americans were initially recruited using study fliers posted in neighborhoods surrounding the Howard University Medical Center as well as other District of Columbia neighborhoods in which population demographics were consistent with study inclusion criteria and through referrals from previous participants. For this study, data from 378 participants were utilized based on their completion of all study self-report measures. There were no significant demographic differences between those with complete data and non completers. The average age of the sample was 22 years (range 18–35), 53% were female, 79% had at least some college, and 34% reported income below the poverty level, compared to 14.3% nationally (US Census Bureau, 2011).

Measures

A battery of self-report measures was administered to each participant. A demographic questionnaire obtained age, gender, race, highest educational level, and household income. A sleep habits survey, developed by the investigative team, asked participants to report their typical bed time and wake time, number and duration of awakenings, and length of time it takes to fall asleep over the past month.

Additional assessments included the Insomnia Severity Index (ISI) a measure that assesses the amount of difficulty falling asleep, staying asleep, and waking early, satisfaction with sleep, impact of insomnia on daily functioning, degree to which others notice, and the amount of distress caused by lack of sleep for a two-week period using a five-point Likert scale rating. The internal consistency for this measure in our sample was $\alpha = .87$, and a score of 10 or higher has been established as optimal for detecting clinically significant sleep difficulties in a community sample (Morin, Bellville, Belanger, & Ivers, 2011).

The Life Events Checklist (LEC) was administered to evaluate exposure to traumatic events over the course of a respondent's lifetime (Gray, Litz, Hsu, & Lombardo, 2004). This 17-item measure includes a list of 16 events that are associated with the development of PTSD and an additional item that allows the respondent to report any other "stressful" event that was not captured by the first 16 items.

The Posttraumatic Stress Disorder Checklist (PCL) was utilized to assess the severity of posttraumatic stress symptoms (Weathers, Litz, Herman, Huska, & Keane, 1999). The PCL is a measure that uses a 5-point Likert scale where higher scores represent increased symptom severity. The internal consistency for the PCL using this sample was $\alpha = .92$. Although several cutoff scores have been suggested for various populations as a threshold for probable PTSD, we used the cutoff score of 44 established for civilians (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996).

The Fear of Sleep Inventory (FOSI; Zayfert et al., 2006) assesses vigilant behaviors, fear of loss of vigilance, and dread of nightmares. It features a 5-point Likert scale format that is anchored by 0 "not at all" and 4 "nearly every night" where higher scores indicate greater nocturnal fears. The FOSI has demonstrated good reliability and modest correlations (Arria et al., 2011; Zayfert et al., 2006) with sleep quality (Pittsburgh Sleep Quality Index; $r = .39$), PTSD severity (PCL; $r = .68$), and insomnia severity (ISI; $r = .32 - .47$). The internal consistency for the FOSI in our sample was $\alpha = .93$.

The City Stress Index (CSI) was administered to assess neighborhood stress. The CSI is an 18-item self-report measure with items that query for indicators of stressful urban environments such as abandoned houses, the sound of gunshots and dilapidated buildings. It has a 4-item response format ranging from never to often and none to most for questions pertaining to magnitude. The scale generates a composite score of neighborhood stress with subscales measuring neighborhood disorder and exposure to violence (i.e. family members or friends who experienced a traumatic event). The CSI has demonstrated modest correlations with census indices of social disadvantage and indicators of emotional distress in urban adolescents (Ewart & Suchday, 2002). The internal consistency for the CSI in our sample was $\alpha = .91$.

Procedures

Approval for this study was obtained through the Howard University Institutional Review Board. Participants were initially screened by phone to ensure that they met study criteria, which included good health (i.e. the absence of any chronic medical condition for which consistent use of medication is required), limited caffeine use (i.e. less than 3 cups of coffee

a day or its equivalent), standard work hours if employed, as well as no alcohol or drug abuse/dependence, and no severe chronic mental illness other than PTSD. Once selected for the study, participants underwent consenting procedures and subsequently completed a battery of self-report measures in a private room located in the clinical research unit of Howard University.

Analytic Strategy

Sample characteristics were assessed using descriptive statistics. Basic checks for normality were conducted for all pertinent variables and square root or log transformations were utilized when appropriate. Chi-square tests and t-tests were conducted to identify significant cross-sectional relationships between insomnia and short sleep duration and potential covariates (i.e., age, gender, income, highest level of education, and poverty). Chi-square tests and t-tests were also utilized to evaluate associations between the outcome variables and the hypothesized risk factors in order to inform the development of the linear regression model tested in the final phase of analysis. While results indicated that insomnia was associated with multiple risk factors, short sleep duration was only associated with one risk factor. To further investigate the multiple associations with insomnia, we constructed a linear regression model to determine which risk factors maintained an independent association and to assess the amount of variance associated with each independent risk factor.

Results

Sleep Patterns

Thirty-seven percent ($n = 139$) of the sample screened positively for insomnia, 28% ($n = 107$) endorsed a habitual sleep duration of 6 hours or less, 14% ($n = 52$) endorsed both insomnia and short sleep duration, and 49% ($n = 186$) had no self-reported insomnia or short sleep duration. There were no significant differences in demographic variables (i.e. age, gender, highest education, and poverty level) between those with or without insomnia or for those with or without short sleep duration. With regard to insomnia, the average score on the ISI was 8.6 ($SD = 6.0$), 23% and 18% endorsed having “difficulty initiating sleep” on weekdays and weekends respectively. It took an average of 24 minutes ($SD = 21$) for participants to fall asleep once in bed. Of those experiencing “difficulty maintaining sleep” the average number of nightly awakenings was 2.1 ($SD = 2.3$) and the average number of minutes awake after sleep onset was 26 minutes ($SD = 41$). Sleep efficiency was similar from weekday to weekend with means of 88% ($SD = 11.3$) and 89% ($SD = 12.3$), respectively. The average sleep duration was 6.8 hrs ($SD = 1.8$). Participants obtained similar amounts of sleep on weekends ($M = 7.0$ hrs, $SD = 1.9$) and weekdays ($M = 6.7$, $SD = 2.0$).

Trauma and PTSD

Eighty-nine percent ($n = 337$) of the sample experienced at least 1 trauma (probable DSM-IV criterion A event) during their lifetime, of which the majority (90%, $n = 339$) endorsed traumas from multiple categories. The most commonly experienced types of traumas included non-sexual physical assaults (32.5%), sexual trauma (13.2%), and transportation accidents (13.0%). Of those who experienced at least one trauma, 34.4% ($n = 116$) met criteria for probable PTSD, which was 30.7% of the total population. Trauma exposed participants had an average PCL score of 37.1 ($SD = 15.3$).

Modeling Insomnia and Short Sleep Duration

As shown in Table 1, t-tests revealed significant associations between insomnia and PCL, FOSI, and CSI scores. FOSI score was the only hypothesized risk factor that was significantly associated with sleep duration. Given that only one risk factor was associated with short sleep duration, linear modeling was only conducted for insomnia. Risk factors that were significantly associated with insomnia were inserted into a linear regression model along with age, gender, education, and the presence/absence of poverty. PCL score and FOSI remained independent risk factors for insomnia severity, each accounting for 35% and 9% of the variance, respectively (see Table 2).

Discussion

Exposure to trauma and PTSD symptoms were common among our non-clinical sample of young adult African Americans living in an urban environment. Insomnia and short sleep duration were also common among this population. Posttraumatic stress symptom severity was independently associated with insomnia severity and fear of sleep was independently associated with insomnia severity and short sleep duration. The risk associated with posttraumatic stress symptom severity and fears of sleep was independent of demographic variables that are often associated with compromised sleep, such as age, gender, education, and poverty. An association between neighborhood stress and insomnia was also observed, however further analysis revealed that this association was not independent of posttraumatic stress symptoms and fears of sleep.

Results of this study were consistent with previous studies that indicated a high prevalence of inadequate or disturbed sleep in African American populations (Ferdinand et al., 2012; Hale & Do, 2007; Kripke et al, 2004). Approximately a third of our sample screened positive for insomnia or endorsed sleeping less than 6 hours per night. Given that both insomnia and short sleep duration have been linked to adverse health outcomes, this finding has broad public health implications as amelioration of these sleep problems could have an impact on health disparities that burden African Americans.

The main findings implicating posttraumatic stress symptom severity and fear of sleep as significant independent factors associated with sleep disturbance in African Americans expands current knowledge of sleep in minority populations. Specifically, our results showed that higher posttraumatic symptom severity and greater nocturnal fears were independently associated with insomnia, while the inventory of sleep fears related to vigilance, fear of loss of vigilance, and nightmares was the only factor associated with short sleep duration. Targeting PTSD symptoms and nocturnal fears in treatment and in public health education could be important for reducing the consequences associated with disturbed sleep in this population. Previous studies suggest that treating PTSD symptoms alone is not sufficient to eliminate concurrent sleep disturbances (Zayfert & Deviva, 2004). Combined treatments, such as cognitive behavioral therapy with imagery rehearsal treatment for nightmares, have been beneficial (Ulmer et. al., 2011). However, incorporating a treatment component that targets nocturnal fears concerning loss of vigilance might increase treatment efficacy among people with PTSD or people living in stressful environments.

It was somewhat surprising that our results revealed only a single association with short sleep duration. One might expect demographic variables (i.e. age or poverty), PTSD symptom severity, or neighborhood stress to impact sleep duration, yet our results do not support a role for these factors in the amount of sleep obtained by young adult African Americans who reside in urban settings. The sole risk factor that was found implicated fears of sleep. Future research might incorporate additional variables such as employment and

social factors into a risk factor model to determine targets for promoting adequate sleep duration.

We hypothesized that neighborhood stress would have a greater impact on sleep disturbance than the results revealed. As previously stated, neighborhood stress was not associated with short sleep duration, however univariate analysis indicated a significant association with insomnia. Upon further analysis, this association was lost when PTSD symptom severity, fears of sleep, age, gender, and poverty were included in the regression model. Given these findings, it is possible that the association with city stress is accounted for by posttraumatic stress symptoms or fears of sleep. It is also possible that our measure of city stress did not fully capture the elements associated with urban living that may contribute to difficulties with sleep in young African American inner city residents. Perhaps a more in-depth analysis of neighborhood stress may yield further insight into specific components of inner city living that confer risk to this population.

There are several limitations to consider in interpreting our findings. First, this study relied on self-report data for both symptoms and sleep habits. Future studies might utilize objective measures of sleep, or incorporate clinical interviews to better characterize symptoms and diagnoses. Secondly, given the cross-sectional nature of these data, prospective research designs could be used to establish temporality and greater confidence in risk factor relationships with insomnia.

In conclusion, this study extends the literature focused on potentially modifiable factors associated with sleep problems in minority populations of young adults. Results demonstrate that young African American adults living in an inner city environment, commonly experience disturbed or inadequate sleep, which will likely impact the health disparities that they are at risk for facing later in life. Posttraumatic stress symptom severity and fears of sleep are both modifiable risk factors that can be targeted by interventions to reduce the prevalence of compromised sleep in inner city African Americans.

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Table 1

Associations with Insomnia and Short Sleep Duration

	Insomnia			Sleep Duration		
	Mean (SD)/n (%)			Mean (SD)/n (%)		
	Probable Insomnia 139 (37%)	No Insomnia 239 (63%)	F-value, p-value	Short sleep 107 (28%)	Normal/Long Sleep 271 (72%)	F-value, p-value
Age	22.4 (3.9)	21.9 (3.6)		22.4 (4.2)	22.0 (3.5)	
Female	82 (59%)	118 (49%)		55 (51%)	145 (54%)	
Poverty Level	49 (35%)	77 (32%)		32 (30%)	94 (35%)	
High School	28 (20%)	48 (20%)		26 (24%)	50 (18.5%)	
# of Trauma Types	3.5 (1.5)	3.4 (1.4)		3.5 (1.4)	3.4 (1.5)	
PCL Score	44.8 (14.0)	29.2 (11.2)	F=141.4, p<.001	36.8 (14.8)	34.2 (14.2)	
FOSI Score	25.4 (19.6)	8.6 (9.8)	F=122.8, p<.001	18.5 (17.5)	13.3 (15.6)	F=8.0, p=.003
CSI Score	41.1 (11.5)	35.6 (10.1)	F=23.2, p<.001	39.1 (10.8)	37.0 (11.0)	

Abbreviations: Standard Deviation (SD), Sample Size (n), Post Traumatic Stress Disorder Checklist (PCL), City Sleep Index (CSI), Fear of Sleep Index (FOSI), Number of Trauma Types.

Table 2
Summary of Regression Analysis Examining Association Between Possible Risk Factors and Insomnia Severity

	Unstandardized Coefficients		Standardized Coefficient	t	p-value
	β	S.E.	Beta		
Sex	-.237	.475	.020	-.499	.618
Age	-.043	.064	-.026	-.668	.504
Poverty	.004	.003	.056	1.431	.153
High School Education	1.420	.606	.094	2.344	.020
PCL Score	1.646	.269	.327	6.113	< .001
FOSI Score	1.172	.158	.402	7.433	< .001
CSI	.002	.025	.004	.096	.923

Abbreviations: Post Traumatic Stress Disorder Checklist (PCL), Fear of Sleep Index (FOSI), City Sleep Index (CSI)