Social Determinants of Health and Sleep Outcomes

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Introduction

Despite the importance of sleep for overall health, sleep is one of the most common aspects of a college student's life that is sacrificed when an individual struggles to balance responsibilities. Insufficient sleep is a public health problem among college students. Approximately 71% of college students sleep less than the recommended eight hours per night and 35% report bedtimes later than 3AM during the school week[1]. Additionally, one-third (32%) of students had trouble falling asleep within 30 minutes at least once a week[1].

Insufficient sleep as a health problem may be influenced by a multitude of social determinants. For example, living in neighborhoods with dirty sidewalks, poor housing, and safety concerns has been associated with a higher rate of sleep problems than neighborhoods characterized by safety and cleanliness[2]. New Brunswick, NJ has surpassed the national average in violent crime since 2002, robberies since 2002, and burglaries since 2002[3]. In addition, a recent survey found that 37% of Rutgers undergraduate students experienced either low or very low food security suggesting that a significant proportion of students are struggling financially[4]. Additionally, students exhibiting food insecurity are at a greater risk for poor sleep quality in comparison to students exhibiting food security[5].

Perceived discrimination and stress have also been associated with poor sleep quality and shorter sleep duration. Individuals who experienced greater overt discrimination and microaggressions exhibited poorer sleep quality[6]. According to the National Sleep Foundation, individuals who identified as Black were the least likely to report having have a good night's sleep[7]. At a university in the Midwest, African-American students reported greater rumination than White students and these scores were correlated with worse sleep quality and perceived discrimination[8]. Thus, studies are needed to better understand the relationship between race and sleep behavior through the lens of social determinants of health.

Aims and Hypothesis

This study aims to determine if there are racial differences in the relationships between social determinants (food insecurity, perceived discrimination, perceived social support, neighborhood environment walkability) and subjective sleep outcomes (daytime sleepiness, sleep latency, sleep efficiency).

We hypothesize that, compared to students who identify as White, those who identify as Black/African-American will exhibit a stronger correlation between food security, perceived social support, built environment, and perceived discrimination and sleep quality, daytime sleepiness.

Methods

Figure 1. *Participant Consort Diagram*
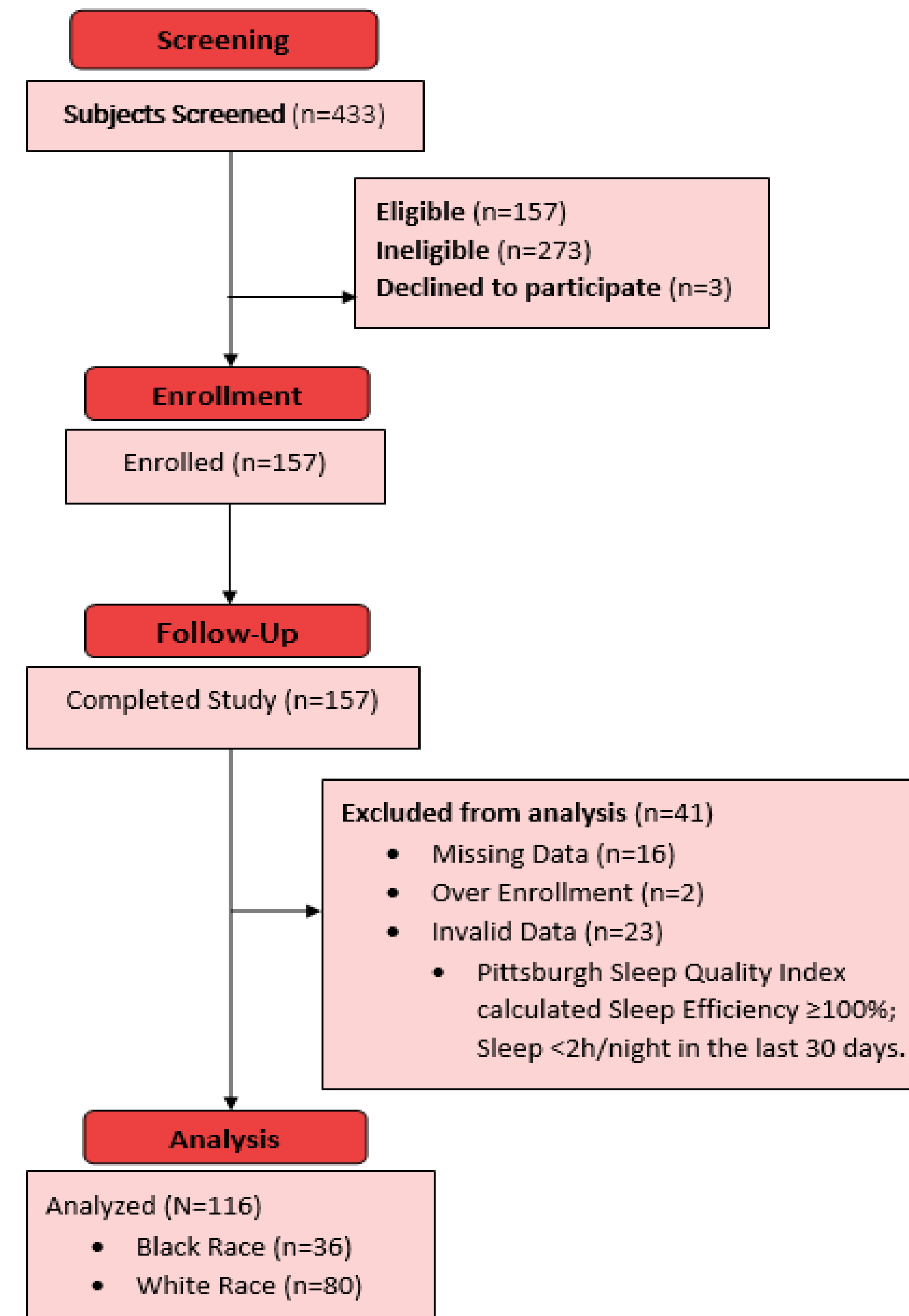
Study Design:

Traditional-age college students were recruited in classroom lobbies and student centers on all 5 Rutgers – New Brunswick campuses. They completed the questionnaires via Qualtrics Survey using an IPad. It took approximately 15 minutes to complete the survey.

Measures included in Electronic Survey:

- Demographics
- Personal Resource Questionnaire[9] (PRQ)
- Neighborhood Satisfaction[10] (NS)
- Safety from Crime[10] (CS)
- Food Security Questionnaire[11]
- Perceived Ethnic Discrimination Questionnaire[12] (PEDQ)
  - Subscales: Devaluation, Threat, Verbal rejection, Avoidance, Exclusion
- Pittsburgh Sleep Quality Index[13] (PSQI)
  - Bedtime & wake time
  - Sleep duration & efficiency
  - Sleep onset latency
- Epworth Sleepiness Scale[14] (ESS)
- Morningness-Eveningness Questionnaire[15] (rMEQ)

Results

Table 1. *Descriptive Statistics for Whole Sample (N=116)*

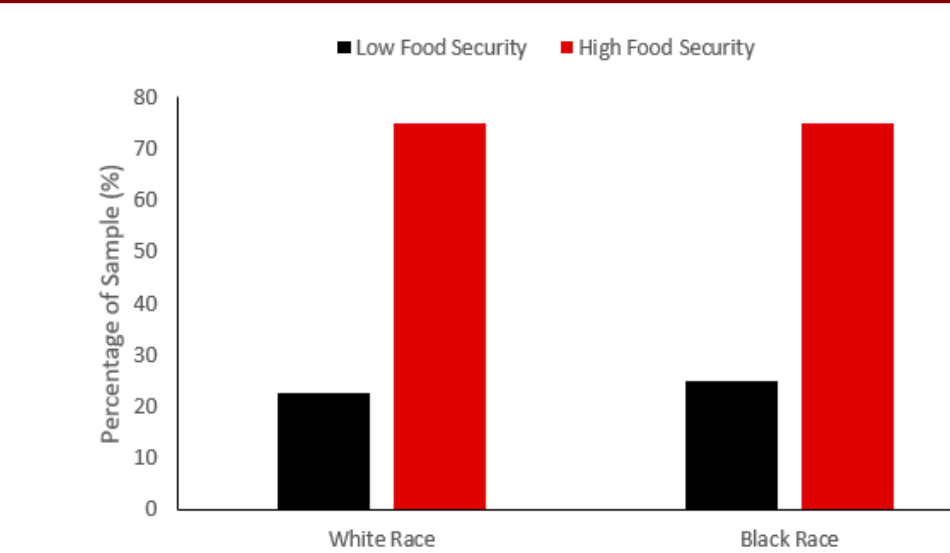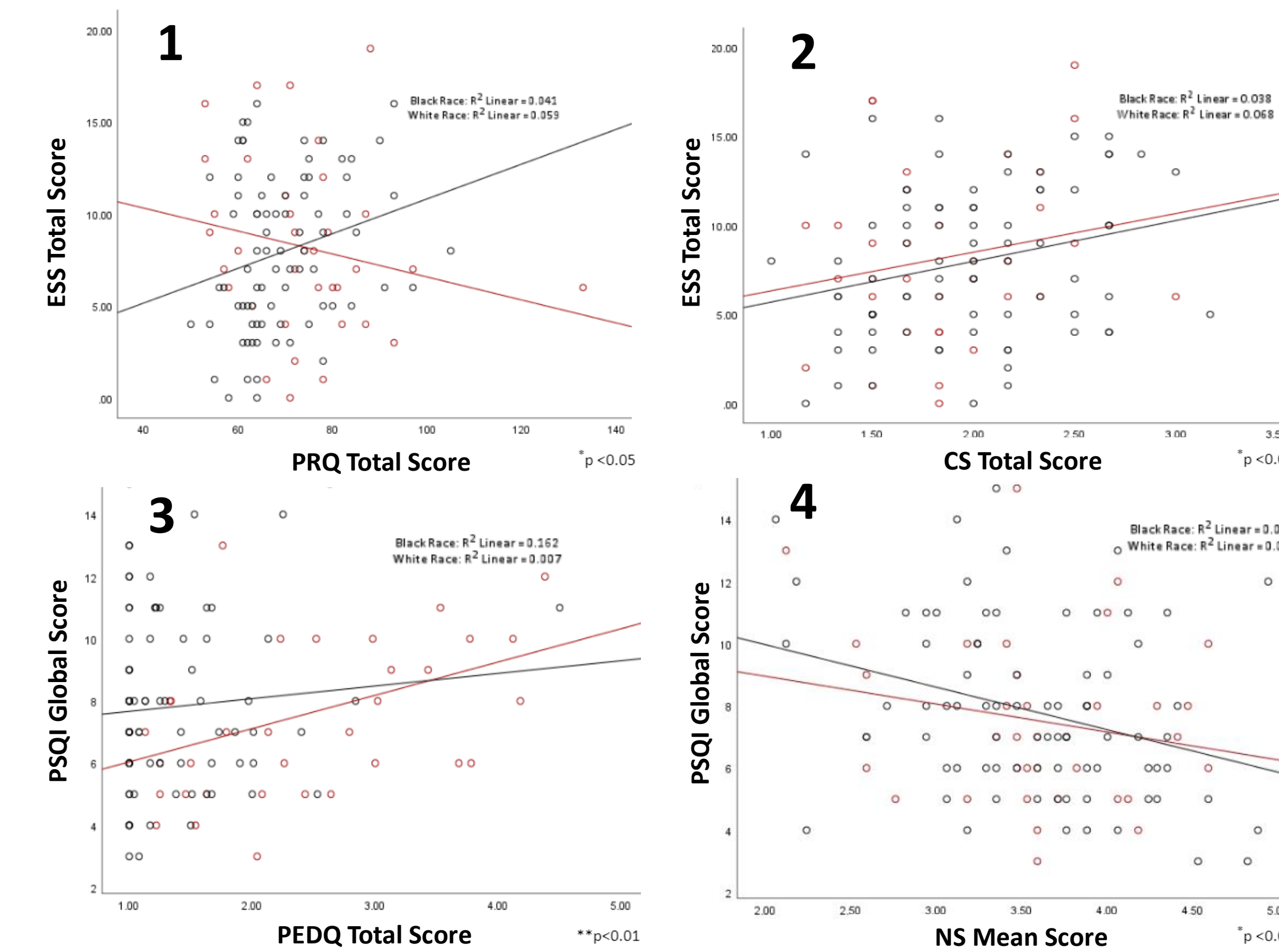| Variable	M (SD) or f (%)
Age	19.8 (1.3)
Year of Study	
Freshman/First Year	39 (33.6)
Sophomore/Second Year	27 (23.3)
Junior/Third Year	25 (21.6)
Senior/Fourth Year	25 (21.6)
Sex	
Female	67 (57.8)
Male	49 (42.2)
Gender	
Woman	66 (56.9)
Man	49 (42.2)
More than 1	1 (0.9)
Race	
Black	36 (31)
White	80 (69)
Ethnicity	
Hispanic	17 (14.7)
Non-Hispanic	99 (85.3)
International Student Status, Yes	3 (2.6)

Figure A. *High and Low Levels of Food Security by White and Black Race.*
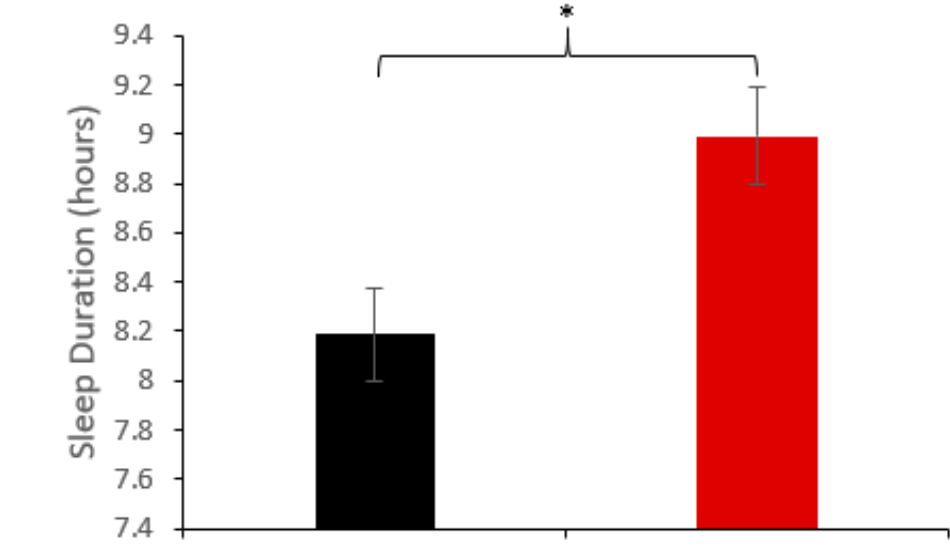
Figure B. *Sleep Duration by White and Black Race. Data presented as Mean ± Standard Error.*

Figures 1-4. *Scatter plots between PRQ and ESS (1), CS and ESS (2), PEDQ and PSQI (3), and NS and PSQI (4) by White and Black Race.*

Legend for Figures 1-4	
○	Black Race
○	White Race
—	Black Race
—	White Race

Figures 1-4. PRQ, CS, and PEDQ correlations showed non-parametric correlations (Spearman) significant at level p<0.05. Neighborhood Satisfaction was a parametric correlation (Pearson) significant at level p<0.01.

Table 2. *Social Determinants of Health for Whole Sample and by White and Black Race*

Variables	Whole Sample (N=116) M (SD) or f (%)	White Race (n=80) M (SD) or f (%)	Black Race (n=36) M (SD) or f (%)
Economic Stability			
Employment Status, Yes	57(49.1)	37(46.3)	20(55.6)
Financial Aid, Yes	75(64.7)	46(57.5)	29(80.6)
Debt, Yes			
Current Debt, Yes	67(57.8)	42(52.3)	25(69.4)
Debt upon Graduation, Yes	66(56.9)	45(56.3)	21(58.3)
No Debt	31(26.7)	23(28.7)	8(22.2)
<$1,000	4(3.4)	3(3.8)	1(2.8)
$1,000-$4,999	9(7.8)	7(8.8)	2(5.6)
$5,000-$9,999	15(12.9)	9(11.2)	6(16.7)
$10,000-$24,999	30(25.9)	22(27.5)	8(22.2)
$25,000-$49,999	18(15.5)	10(12.5)	8(22.2)
>$50,000	9(7.8)	6(7.5)	3(8.3)
Family Income			
<$5,000	1(0.9)	0(0)	1(2.8)
$5,000-$54,999	23(19.8)	15(18.7)	8(22.2)
$55,000-$99,999	28(24.1)	18(22.5)	10(27.8)
$100,000-$154,000	42(36.2)	32(40)	10(27.8)
$155,000-$199,999	12(10.3)	8(10)	4(11.1)
>$200,000	10(8.6)	7(8.8)	3(8.3)
Built Environment			
Residential Status, On Campus	69(59.5)	38(47.5)	31(86.1)
Neighborhood Satisfaction Total Score	3.6(0.6)	3.6(0.6)	3.6(0.6)
Safety from Crime Total Score	1.9 (0.5)	1.9 (0.4)	2.0 (0.5)
Live with others, Yes	116 (100.0)	80(100.0)	36(100.0)
Share a room, Yes	78(67.2)	53(66.3)	25(69.4)
Education			
Father's education			
<High School	30(25.9)	20(25)	10(27.8)
>High School	84(72.4)	60(75)	24(66.7)
Not Sure	2(1.7)	0(0)	2(5.55)
Mother's education			
<High School	26(22.4)	17(21.3)	9(25)
>High School	89(76.7)	63(78.7)	26(72.2)
Not Sure	1(0.9)	0(0)	1(2.8)
Food security			
Meal Plan, Yes	67(57.8)	40(50)	27(75)
Food Security Scale			
Very Low Food Security	11(9.5)	7(8.8)	4(11.1)
Low Food Security	16(13.8)	11(13.7)	5(13.9)
High Food Security	89(76.7)	62(77.5)	27(75)
Community and Social Context			
Perceived Ethnic Discrimination			
Devaluation	1.8 (1.2)	2.7 (1.4)	1.4 (0.8)
Threat	1.3 (0.8)	1.7 (1.2)	1.1 (0.5)
Verbal Rejection	1.9 (1.1)	2.7 (1.1)	1.6 (0.8)
Avoidance	1.7 (1.1)	2.5 (1.4)	1.3 (0.7)
Exclusion	1.5 (1.0)	2.3 (1.3)	1.2 (0.6)
Total Score	1.7 (0.9)	2.4 (1.0)	1.4 (0.6)
Personal Resource Total Score	71.0 (12.4)	74.1 (15.2)	69.6 (10.7)

Discussion

- Compared to Black Race students, White Race students reported spending 48 fewer minutes in bed on average (F_1=6.695, p=0.011).
- There were no significant differences when comparing percentages of high and low food security between White race and Black race students.
- Personal Resources and Daytime Sleepiness were found to be weakly positively correlated, r(78) = .23, p<0.05 in White race students. There was no significant correlation between these variables in Black race students.
- Safety from Crime and Daytime Sleepiness were found to be weakly positively correlated, r(78) = .26, p<0.05 in White race students. There was no significant correlation between these variables in Black race students.
- Perceived Discrimination and the Pittsburgh Sleep Quality Index global score were found to be moderately positively correlated, r(34) = .41, p<0.05 in Black race students. There was no significant correlation between these variables in White race students.
- Neighborhood Safety and Pittsburgh Sleep Quality Index global score were found to be moderately negatively correlated, r(78) = -.31, p<0.01 in White race students. There was no significant correlation between these variables in Black race students.
- One limitation of this study was a small sample size of Black race students in comparison to White race students. Secondly, objective sleep variables were not reported, which would have allowed for more accurate measures of sleep quality. Findings from this study demonstrate the potential impact of social factors on sleep in college students. Rutgers should implement programs to address racial/ethnic biases among students to improve sleep.

References

1. Lund, H.G., et al., *Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health, 2010. 46(2): p. 124-32.*
2. Singh, G.K. and M.K. Kenney, *Rising Prevalence and Neighborhood, Social, and Behavioral Determinants of Sleep Problems in US Children and Adolescents, 2003-2012. Sleep Disord, 2013. 2013: p. 394320.*
3. Crime rates New Brunswick, New Jersey (NJ): murders, rapes, robberies, assaults, burglaries, thefts, auto thefts, arson, law enforcement employees, police officers, crime map. 2018.
4. Cuy-Castellanos, D. and F.J. Holcomb, *Food insecurity, financial priority, and nutrition literacy of university students at a mid-size enrollment institution. J Am Coll Health, 2020. 68(1): p. 16-20.*
5. Cares, L.L, S.K., Victoria Parito Reld, Rayna S. Martindale, Kerri A. Willson. Food Insecurity Among Students at Rutgers University-New Brunswick. 2016. Available from: http://humeco.rutgers.edu/documents_pdf/Rut_Student_Food_Insecurity_2016.pdf
6. D'Zea, A., et al., *Race and context and correlates of food insecurity among U.S. college students: a multi-institutional study. BMC Public Health, 2019. 19(1): p. 660.*
7. Huynh, V.W. and E. Gillen-O'Neel, *Discrimination and Sleep: The Protective Role of School Belonging. Youth & Society, 2016. 48(5): p. 649-672.*
8. Drake, C., et al. Sleep in America Poll. 2009.
9. Haggart, L.S. and L.A. Vell, *Examining How Racial Discrimination Impacts Sleep Quality in African Americans: Is Perseveration the Answer? Behav Sleep Med, 2018. 16(5): p. 471-481.*
10. Gage, G.S., Social Support and Positive Health Practices in Black Late Adolescents:The Role of Mediating Variables. Clinical Nursing Research, 2017. 26(1): p. 93-113.
11. Mujahid, M.S., et al., *Assessing the measurement properties of neighborhood scales: from psychometrics to ecometrics. American Journal of Epidemiology, 2007. 165(8): p. 858-867.*
12. Blumberg, S.J., et al., *The effectiveness of a short form of the Household Food Security Scale. Am J Public Health, 1999. 89(8): p. 1231-4.*
13. Brondolo, E., et al., *The Perceived Ethnic Discrimination Questionnaire: Development and Preliminary Validation of a Community Version. Journal of Applied Social Psychology, 2005. 35(2): p. 335-365.*
14. de la Vega, R., et al., *The Pittsburgh Sleep Quality Index: Validity and factor structure in young people. Psychol Assess, 2015. 27(4): p. e22-7.*
15. Johns, M.W., *A New Method for Measuring Daytime Sleepiness: The Epworth Sleepiness Scale. Sleep, 1991. 14(6): p. 540-545.*
16. Adan, A. and H. Almirall, Horne & Östberg Morningness-eveningness questionnaire: A reduced scale. Personality and Individual Differences, 1991. 12(3): p. 241-253.

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