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Early Interv Psychiatry. Author manuscript; available in PMC 2023 March 28.

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Published in final edited form as:

Early Interv Psychiatry. 2022 January ; 16(1): 106–110. doi:10.1111/eip.13129.

Sleep Quality and its Relationship to Mental Health, Physical Health, and Health Behaviors Among Young Adults with Serious Mental Illness Enrolled in a Lifestyle Intervention Trial

Kelly A. Aschbrenner, PhD^a, John A. Naslund, MPH, PhD^b, Jessica K. Salwen-Deremer, PhD^{a,c}, Julia Browne, PhD^d, Stephen J. Bartels, MD, MS^e, Rosemarie S. Wolfe, MS^a, Haiyi Xie, PhD^f, Kim T. Mueser, PhD^{a,g}

^aDepartment of Psychiatry, Geisel School of Medicine at Dartmouth, Lebanon, NH

^bDepartment of Global Health and Social Medicine, Harvard Medical School, Boston, MA

^cDepartment of Medicine, Geisel School of Medicine at Dartmouth, Lebanon, NH

^dGeriatric Research, Education, and Clinical Center, Durham VA Health Care System, Durham, NC

^eMongan Institute, Department of Medicine, Massachusetts General Hospital

^fBiomedical Data Sciences, Geisel School of Medicine at Dartmouth, Lebanon, NH

^gCenter for Psychiatric Rehabilitation, Departments of Occupational Therapy and Psychological & Brain Sciences, Boston University, Boston, MA

Abstract

Aim: To characterize subjective sleep quality and examine its associations with mental health, physical health, and health behaviors in a transdiagnostic sample of young adults with serious mental illness (SMI) enrolled in a lifestyle intervention trial.

Methods: Baseline data from a lifestyle intervention trial with young adults (ages 18–35 years) with SMI included the Pittsburgh Sleep Quality Index (PSQI), mental health, physical health, and health behavior outcomes. Descriptive statistics and multiple linear regression were used in analyses.

Results: Of 150 participants, 76% were categorized with poor sleep quality. Depressive symptoms were significantly associated with sleep quality ($\beta = .438$, $p < .001$); however, no association was found with physical health and health behaviors.

Conclusions: Young adults with SMI enrolled in lifestyle interventions may benefit from treatment that addresses sleep as part of a comprehensive approach to health promotion with attention to the role of depressive symptoms in sleep quality.

Corresponding Author: Kelly Aschbrenner, PhD, Dartmouth-Hitchcock Health System, 294 Daniel Webster Highway, Merrimack, NH 03054, (603) 440-7541 Office, Kelly.A.Aschbrenner@Dartmouth.edu.

Conflict of Interest Statement

The authors have no competing interest to disclose.

Keywords

Sleep; serious mental illness; depressive symptoms; lifestyle intervention; young adults

INTRODUCTION

Individuals with serious mental illness (SMI), including schizophrenia-spectrum and severe bipolar and depressive disorders, have a life expectancy that is 8 to 32 years less than people without mental illness (Colton & Manderscheid, 2006; Druss et al., 2011). This early mortality disparity is largely due to cardiovascular disease and other preventable chronic illnesses (Casey Crump et al., 2013; Olafson et al., 2015). Smoking cessation, physical activity and exercise, and dietary changes have been the primary targets of lifestyle interventions addressing cardiovascular health among individuals with SMI to date (Bartels et al., 2013; Bartels et al., 2015; Daumit et al., 2013; Green et al., 2015; Peckham et al., 2017). However, poor sleep is also a risk factor for cardiovascular disease and premature mortality (Cappuccio et al., 2010; Daglas et al., 2019; Kwok et al., 2018), and sleep problems are common among adults with SMI across diagnostic groups (Freeman et al., 2020; Laskemoen et al., 2019) and negatively impact functioning and quality of life (Faulkner & Bee, 2016).

Individuals with SMI place a high value on getting good quality sleep (Klingaman et al., 2019) and prefer non-pharmacological sleep treatment that is personalized and part of a whole-lifestyle approach (Faulkner & Bee, 2017). Lifestyle interventions have been shown to improve sleep among overweight and obese individuals in the general population (MacLeod et al., 2018; Tan et al., 2016), and may be an effective modality for treating interrelated health behaviors of diet, exercise, and sleep among adults with SMI. The present exploratory study characterized subjective sleep quality and examined its relationship with other health behaviors in a transdiagnostic sample of young adults with SMI enrolled in a lifestyle intervention trial.

MATERIALS AND METHODS

This secondary data analysis used baseline data of randomized participants in the Fit Forward trial ([ClinicalTrials.gov Identifier: NCT02815813](#)) designed to evaluate the effectiveness of a peer support and mobile health technology intervention to reduce cardiometabolic risk in young adults with SMI. A trial protocol is described elsewhere (Aschbrenner et al., 2018). Participants enrolled were 150 young adults (43% men) aged 18 to 35 years ($M = 28.38$, $SD = 4.54$) with a BMI 25 kg/m^2 ($M = 37.14$, $SD = 7.4$) who had an SMI (i.e., 43% Psychotic Disorders; 37% Mood Disorders; 17% Post-traumatic Stress Disorder (PTSD); and 3% Anxiety Disorders), and wanted to lose weight and improve fitness through supported behavioral changes. Fifty-four percent of the sample identified as White and 30% identified as Latino. Seventy-one percent were taking antipsychotic medications at the time they enrolled in the study. The study sites were four community mental health centers located in the northeast U.S. This study used baseline data collected before randomization and initiation of experimental treatments between April 2017 and

August 2019. The study was approved by local institutional review boards and participants gave written informed consent to participate.

Assessments

Baseline assessments documented demographic, sleep, mental health, physical health, and health behavior variables. Trained research interviewers administered research assessments to participants who were paid \$50 USD for completing the interview. The dependent variable, sleep quality, was assessed using the self-report Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989), with 19 self-rated questions combined to form seven components scores: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance (e.g., bad dreams, pain, feeling too hot/too cold), use of sleep medication, and daytime dysfunction, each of which has a range of 0–3 points. A score of “0” indicates no difficulty, while a score of “3” indicates severe difficulty. The seven components are then added to yield one global score with a range of 0–21 points, with higher scores indicating worse sleep quality. A global score of < 5 is associated with good sleep quality and a score of > 5 is associated with poor sleep quality. The global score was used as the continuous outcome variable in the multiple linear regression model.

Independent variables included mental health, physical health, and health behavior variables. Mental health variables included self-reported depressive symptoms measured using the 20-item Center for Epidemiologic Studies Depression (CES-D) Scale (Radloff, 1977), with a score range of 0–60 (higher scores reflect greater severity), and self-reported antipsychotic medication use (yes/no). Physical health variables included objective measures of body mass index (BMI) calculated from measured height and weight (kg)/height(m)², cardiorespiratory fitness assessed using the 6-Minute Walk Test (6-MWT) (Rasekaba et al., 2009), and obesity level (<40 BMI vs. ≥ 40 BMI). Health behavior variables included self-reported physical activity measured on the International Physical Activity Questionnaire (IPAQ) with a summary score calculated for vigorous activities obtaining an estimate of weekly metabolic equivalent expenditure (MET) minutes of vigorous physical activity (Booth, 2000); sedentary behavior measured by the Sedentary Behavior Questionnaire (SBQ) (Rosenberg et al., 2010), which assess the amount of time spent doing nine sedentary behaviors (e.g., watching television, playing computer/video games, driving riding in a car or bus). For each of the nine items, participants respond to the question, “On a typical weekday (or weekend day), how much time do you spend (from when you wake up until you go to bed) doing the following?” The available response options are none, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, or 6 hours. Average sedentary hours across all days were calculated. Higher scores on the SBQ indicate more time performing sedentary behaviors; and finally, self-reported current smoking was assessed with a yes/no question and frequency and amount of alcohol use in the past 30 days assessed with questions adapted from the Behavioral Risk Factor Surveillance System (Prevention, 2016).

Data Analysis

Descriptive statistics for PSQI subcomponent variables were calculated. Multiple linear regression was used to examine the relationship between the global PSQI sleep quality score and independent variables representing mental health (i.e., depressive symptoms and

antipsychotic medication use), physical health (i.e., BMI, cardiorespiratory fitness, obesity level), and health behaviors (i.e., vigorous activity, sedentary behavior, current smoking status, and frequency and amount of drinking in past 30 days). Participants' gender and age were included as covariates in each of the regression models.

RESULTS

As summarized in Table 1, 76% of participants were categorized with poor sleep quality, and 34% described their sleep quality as either "fairly bad" (22%) or "very bad" (12%). Fifty-three percent of participants indicated that they could not fall asleep within 30 minutes at least once per week, whereas 69% reported 7 or more hours of sleep per night, on average, over the past month. Forty-five percent of participants indicated they use medications to fall asleep three or more times per week. Multiple regression analysis was used to test if the mental health, physical health, and health behavior variables were significantly associated with the global PSQI sleep quality variable. The results of the regression indicated the independent variables explained 33% of the variance in sleep quality and the overall regression model was a good fit for the data ($R^2=.330$, $F(12,138)=5.16$, $p<.001$). Self-reported depressive symptoms were significantly and positively associated with sleep quality. ($\beta = .438$, $p < .001$), whereby greater depressive symptoms were associated with worse sleep quality.

DISCUSSION

The purpose of this exploratory study was to characterize subjective sleep quality and examine its relationship with mental health and physical health and health behaviors in a transdiagnostic sample of young adults with SMI enrolled in a lifestyle intervention trial. We did not find significant associations between sleep quality and physical health and health behaviors at baseline in this sample; however, sleep quality was significantly associated with depressive symptoms consistent with prior research (Freeman et al., 2020). Findings from this brief report suggest that young adults with SMI enrolled in lifestyle interventions at community mental health centers may benefit from treatment that addresses sleep as part of a comprehensive approach to health promotion with specific attention to the role of depressive symptoms in sleep quality.

Seventy-six percent of participants were categorized with poor sleep quality on the PSQI. In a large sample of college students aged 17 to 24, 60% of participants were categorized with poor sleep quality on the PSQI (Lund et al., 2010). Other studies with college students have classified 28%- 62% of participants as poor sleepers (Becker et al., 2018; Liu et al., 2020). The current sample included young adults aged 18 to 35 with SMI enrolled in a lifestyle intervention trial. The proportion categorized as having poor sleep quality was high. The point at which young adults with SMI express interest in health promotion and wellness programs may be an opportune time to engage them in a comprehensive approach to lifestyle change that includes sleep.

Surprisingly, physical health and health behavior variables were not significantly associated with the PSQI global sleep quality score. Prior research has shown a bidirectional

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relationship between sleep, exercise, and diet (Dashti et al., 2015; Kline, 2014; Lundahl & Nelson, 2015), and poor sleep quality has been linked to metabolic disorders, weight gain, and obesity (Beccuti & Pannain, 2011). Research using objective measures of sleep structure or quality may find relationships between sleep and physical health and health behaviors in this population. Discrepancies between subjective and objective measures of sleep have been shown in psychiatric populations (Krishnamurthy et al., 2018; Werner et al., 2016). While the primary interest of our study was patient reported outcome measures of sleep quality, future longitudinal research could include both subjective and objective measures of sleep to rigorously evaluate its relationship with changes in health behaviors and mental health and physical health outcomes.

Limitations of the study also include the cross sectional design and select sample. The cross sectional design does not allow for determining the direction of the relationship between depression and sleep quality. While our sample of young adults with SMI who were motivated to enroll in a lifestyle intervention to lose weight and improve their fitness provides insight into sleep quality in this group, the sample also potentially limits generalizability of the findings to young adults with SMI in general.

CONCLUSION

Poor sleep quality is common among young adults with SMI who enrolled in a lifestyle intervention to lose weight and improve fitness. Depressive symptoms were significantly associated with poor sleep quality in this transdiagnostic sample of young adults with serious mental illness while physical health and health behaviors were not associated with sleep. Promoting good sleep as part of comprehensive lifestyle intervention for young adults with SMI and addressing the role of depressive symptoms in sleep quality should be considered in future research in this group.

Acknowledgments

The National Institute of Mental Health (R01 MH110965) provided funding for this study. The findings and conclusions of this report are those of the authors and do not officially position the funders.

Data Availability Statement

The data that support the findings of this study will be available through the National Institute of Mental Health Data Archive (NDA) 1–2 years after the grant end date of May 31st, 2020, as defined in the applicable Data Sharing Terms and Conditions. All data will be de-identified and collected from subjects who have broadly consented to share their data for research use or who have consented to share their data for research, with data use limitation.

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Table 1

Sleep Quality and PSQI Component Scores for Participants at Baseline

Baseline PSQI Item	<u>Full sample</u>	
	n	%
Total Sleep quality		
Good Sleep	35	24
Poor Sleep	113	76
Subjective Sleep quality		
Very good	31	21
Fairly good	68	45
Fairly bad	33	22
Very bad	18	12
Cannot sleep within 30 minutes		
Not during the past month	40	27
Less than once a week	30	20
Once or twice a week	24	16
Three or more times a week	55	37
Sleep Duration		
>7 hours	104	69
6–7 hours	20	13
5–6 hours	14	9
<5 hours	12	8
Sleep Efficiency		
>85%	67	45
75–84%	29	19
65–74%	28	19
<65%	26	17
Sleep Latency Component		
15 minutes	20	14
16–30 minutes	44	30
31–60 minutes	39	26
>60 minutes	45	30
Use of Sleep Medications		
Not during the last month	66	44
Less than once a week	12	8
Once or twice a week	5	3
Three or more times a week	67	45
Sleep Disturbance		
0	1	1
1	61	40
2	73	49
3	15	10

Baseline PSQI Item	<u>Full sample</u>	
	n	%
Daytime Dysfunction Due to Sleepiness		
0	37	25
1	71	47
2	34	23
3	8	5

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