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# Generalized stress and sleep hygiene explain the relationship between sexual/gender identity and sleep quality

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## ABSTRACT

**Introduction:** Typically, LGBTQ+ people sleep more poorly than their cisgender heterosexual (cis het) counterparts. However, there is a lack of literature investigating the impact of different lifestyle/psychosocial factors, outside of minority stress, on the negative relationship between being a sexual/gender identity minority and sleep quality. The current study aims to help fill critical gaps in the literature by looking at the effects generalized stress, COVID-19-related stress, social support, and sleep hygiene have on this relationship.

**Methods:** Two hundred and seventy-three participants (74 LGBTQ+; 199 cis het), recruited online, completed a series of questionnaires assessing sleep quality, sleep hygiene, generalized stress, minority stress, COVID-19-related stress, and social support.

**Results:** Analyses showed that LGBTQ+ participants reported worse sleep quality, higher levels of generalized stress and COVID-19 stress, and smaller social networks than their cis het peers. Generalized stress fully mediated the relationship between sexual/gender identity and sleep while sleep hygiene partially mediated the relationship between generalized stress and sleep quality. Social support and COVID-19-related stress did not moderate the relationship between generalized stress and sleep.

**Conclusion:** Worse sleep quality in LGBTQ+ than cis het adults is explained by differences in generalized stress and sleep hygiene. Stress management and sleep hygiene interventions may help prevent the negative associations between being LGBTQ+ and poor sleep quality.

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LGBTQ+; sleep quality;  
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## Introduction

Emerging research has shown that LGBTQ+ people report worse sleep quality than cis-gender heterosexual (cis het) people (Galinsky et al., 2018;

Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). Furthermore, LGBTQ+ people experience a higher prevalence of mental health disorders, such as major depression, and poorer physical health including higher rates of chronic illness (Cochran et al., 2003; Cochran & May, 2007; Conron et al., 2010). Longitudinal studies have found that high sleep quality is linked to a lower risk of cognitive decline and better physical health outcomes as people age (Chaput et al., 2020; Xu et al., 2020). Thus, it is important to identify factors that may exacerbate or ameliorate these group differences to narrow health disparities between LGBTQ+ and cisgender individuals across the lifespan.

One such factor impacting sleep quality and health outcomes of LGBTQ+ people is minority stress. The minority stress model examines how external and internalized stigma, prejudice, and discrimination create a stressful social environment that causes mental health problems for the LGBTQ+ community (Meyer, 2003). This model has been pivotal in the development of other scales to measure minority stress and even study how LGBTQ+-related stress impacts health. Poor sleep quality is partially a result of different aspects of minority stress such as sexual victimization, bullying, discrimination, and other factors (Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). Recent literature shows that those who identify as a sexual minority, report higher perceived stress than their heterosexual peers (Krueger et al., 2018). There is a gap in the literature investigating general perceived stress in the LGBTQ+ community and most research focuses on the impact of minority stress. However, these studies do not explicitly state whether generalized stress was controlled for, leaving the question of how many of these minority stress differences were further exacerbated by the impact of generalized stress, or if any factors can protect against the effects of stress on sleep quality.

Several lifestyle factors may be positively associated with better sleep quality such as social support and sleep hygiene. Poor sleep hygiene involves performing behaviors that can be disruptive to sleep such as using the bed for activities not involving sleep, planning, worrying, eating, or engaging in strenuous mental or physical activities before going to bed. Better sleep hygiene is linked to higher sleep quality and lower stress levels in young and older adults (Anwer et al., 2019; Getachew et al., 2020; Wade et al., 2021). Social support may also act as a protective factor for sleep in LGBTQ+ people. High social support has been linked to lower pre-sleep arousal and higher overall sleep quality (Morin et al., 2003). People who report higher social support, are more likely to engage in positive reframing during cognitive restructuring than those who report lower perceived social support. This reframing may help minimize stressful thoughts before sleep leading to better sleep hygiene and increased sleep

quality in adults (Calvete & Connor-Smith, 2006). More specifically, studies have shown that LGBTQ+ youth perceive less support and closeness from their parents and families than their cishet peers (Pearson & Wilkinson, 2013). However, if perceived social support increases, it can act as a protective factor against depressive symptoms in LGBTQ+ adolescents and college students (Chang et al., 2021; Moran et al., 2018). Studies have also shown that increased social support is associated with increased self-esteem while lack of social support was associated with higher levels of depression, anxiety, drug misuse, low self-esteem, risky sexual behaviors, and shame in members of the LGBTQ+ community (McDonald, 2018). The previous research demonstrates that positive lifestyle and psychosocial factors may facilitate higher sleep quality in adults. However, the protective potential of these factors on the negative effects of stress on sleep quality is understudied in LGBTQ+ adults.

Emerging research shows that people have experienced increased sleep problems during the pandemic and associated these problems with increased psychological distress (Alimoradi et al., 2021; Jahrami et al., 2021). A recent study on young adults found that stress related to COVID-19 partially explained poorer self-reported sleep quality in Black adults as compared to other racial/ethnic groups (Yip et al., 2021). However, this study did not control for general stress, making it unclear whether COVID-19-related stress, *per se*, explained sleep disparities between groups. Here, we examined the potential unique impact of COVID-19-related stress, controlling for general stress, on sleep quality in LGBTQ+ and cishet adults.

The current study aims to help fill critical gaps in the literature by assessing potential factors that may explain, protect, or exacerbate the negative relationship between stress and sleep quality in LGBTQ+ and cishet adults. All participants completed questionnaires assessing sleep quality, social support, generalized stress, and COVID-19-related stress (henceforth referred to as COVID-19 stress). LGBTQ+ participants were also asked to complete a survey assessing sexuality/gender identity-based minority stress.

Given the evidence of negative relationships between identifying as LGBTQ+ and sleep quality in the literature, such as the findings of Galinsky et al. (2018) and Martin-Storey et al. (2018), we predict that LGBTQ+ participants would report worse sleep quality than their cishet peers. Based on the theoretical links outlined above, we predict that LGBTQ+ participants would report higher levels of generalized stress, as well as, worse sleep quality, sleep hygiene, and less social support than their cishet peers. We hypothesized that higher generalized stress and poorer sleep hygiene would at least partially explain the relationship between group and sleep quality. We predicted that higher social support would predict better sleep quality while COVID-19 stress would predict poorer sleep quality, across

groups. Moreover, we expect social support and COVID-19 stress to moderate associations between general stress and sleep quality. Based on the findings of Meyer (2003), we further hypothesized that minority stress will act as a negative moderator of the association between generalized stress and sleep quality in LGBTQ+ subjects, and exacerbate the negative effects generalized stress has on sleep quality.

## **Materials and methods**

### ***Participants and design***

We recruited LGBTQ+ and cisgender heterosexual participants across the adult lifespan (hereafter, referred to as LGBTQ+ and cishet). We recruited all participants using the online recruitment service, Prolific (<https://www.prolific.co>). Participants were required to be U.S. residents with good eyesight (e.g., the ability to clearly see a computer screen), and proficiency in English. They were paid \$20 for completing the experiment. Consent forms were approved by the Georgia Institute of Technology Institutional Review Board.

Participants were asked to complete a series of questionnaires using Qualtrics (see measures section). The questionnaires were completed during two separate sessions spaced 48 hours apart to avoid participant fatigue, with each session lasting approximately one hour. The study resulted in 364 participants who completed both sessions. We screened submissions for several issues including duplicate submissions, uniform response patterns, and missing and/or incomplete data. Of the recruited 364 participants, 91 were excluded for incomplete questionnaire data. Of the remaining 273 participants, 74 identified as LGBTQ+ (mean age:  $36 \pm 13.7$ ; mean years of education:  $15 \pm 2.12$ ; average education quality:  $1.77 \pm 0.48$ ; race: 55 White, 10 Black/African American, five Asian/Pacific Islander, four Mixed/Other; gender identity: 49 female (1 transgender), five nonbinary, and 20 men (one transgender)) and 199 identified as cishet (mean age:  $44 \pm 15.4$ ; mean years of education:  $16 \pm 2.4$ ; average education quality:  $1.77 \pm 0.45$ ; race: 122 White, 74 Black/African American, three Mixed/Other; gender identity: 106 female and 93 male).

## **Measures**

### ***Demographics***

We collected demographic information regarding age, gender, sexual orientation, race, ethnicity, years of formal education, education quality (self-reported measure ranging from 0[poor] to 2[excellent]), and general health. We assessed gender/sexual minority status with a single question,

“The next section contains questions about sexual and gender identity please identify which group(s) you belong to (Choose all that apply).” Responses included “Heterosexual,” “Homosexual,” “Bisexual,” “Transgender,” “Cisgender,” “Non-Binary,” “Queer,” “Intersex,” “Asexual/Aromantic,” and “Other (please specify).”

### ***Sleep quality and hygiene***

Sleep quality and sleep hygiene were both variables of interest for this study. The Pittsburgh Sleep Quality Index (PSQI) was administered to assess sleep quality (Buysse et al., 1989). Using the PSQI, a global measure of sleep quality was computed, where scores could range between 0 and 21, with higher scores reflecting poorer sleep quality, and lower scores representing better sleep quality. Sleep hygiene was measured using the Sleep Hygiene Index (SHI) (Mastin et al., 2006). Similarly, a higher score reflects a greater endorsement of behaviors that were not conducive to high-quality sleep (e.g., watching TV, eating while in bed) and poorer sleep hygiene but with scores ranging between 0 and 52.

### ***Psychosocial factors***

We measured several psychosocial factors that may impact sleep quality, including social support, generalized stress, and minority stress. To assess social support, we used subscales from the MOS Social Support Survey (MOS) (Sherbourne & Stewart, 1991). Specifically, we examined the size of participants’ social networks, degree of emotional support, and positive social interaction. General stress symptoms were assessed with the stress subscale of the Depression, Anxiety, and Stress Scale-21 (DASS-21), where participants’ scores could range between 0 and 21 (Lovibond & Lovibond, 1995). Minority stress was measured using the distress score of the Daily Heterosexist Experiences Questionnaire where scores range between 0 (no distress) and 1 (extremely distressed) (Balsam et al., 2013). This data was collected during the COVID-19 pandemic. Thus, we wanted to explore the role of stress associated with the pandemic specifically in sleep quality for both groups. We developed a questionnaire that assessed multiple facets of stressors related to COVID-19. Responses ranged from 0 (did not experience) to 3 (high strain). See [Table 1](#) for all items and response options of the COVID-19 stress measure. The internal reliability of this measure was determined through Cronbach’s alpha (0.60). The Spearman-Brown Prophecy formula found that the reliability of the COVID-19 stress measure increased to 0.75 when the test length was doubled, suggesting that the moderate reliability was due to the short length of the test and not the nature of the questions.

**Table 1.** COVID-19 stress measure.

Instruction and Response Options	The following questions pertain to changes that you may have experienced related to COVID-19. Please rate on a scale of 0–3 how the following circumstances have affected you:	0	1	2	3
		Did not experience	Yes, but it did not bother me	Yes, it bothered me somewhat	Yes, it bothered me a lot
Items	A drop in income related to COVID-19? New family care duties (e.g., homeschooling, child care, caring for an elderly parent, providing meals)? Feelings of anxiety or depression? Poor internet access at home?				

**Data analysis**

The MOS is composed of multiple, likely correlated measures (i.e., emotional support, tangible support, network size, and positive social interaction). To reduce the dimensionality of the data, we subjected these variables to a principal component analysis. Principal component 1 (PC1) accounted for 92.29% of the variance for this data set and was mostly associated with the social network size subset of the MOS. Thus, social network size was the variable used for the following analyses.

Statistical analyses were conducted using RStudio. First, we examined group differences in sleep quality and psychosocial factors using a series of ANCOVAs, including age and years of education as covariates. Pearson’s correlation was conducted to analyze the correlation between minority stress and sleep quality in LGBTQ+ participants. We conducted a serial mediation analysis, where we assessed the indirect effect relationship between group and sleep quality through generalized stress (i.e., the  $a_1$ - $b_1$  path; Figure 1), and through both generalized stress and sleep hygiene (i.e., the  $a_1$ - $d_{12}$ - $b_2$  path; Figure 1). This approach used bootstrapping, which repeatedly samples the data with replacement (in this case, 1,000 bootstrap resamples) to create an approximation of the sampling distribution of the indirect effect. The indirect effect was calculated using the product of coefficients method. A hierarchical regression model was used to investigate the direct relationships between COVID-19 stress, introduced in Block 3, and social network size, introduced in Block 4, with sleep quality as the outcome measure. As well as their potential moderating impact on the relationship between generalized stress and sleep quality.

**Results**

***Psychosocial factors and sleep quality differ between groups***

We assessed gender/sexual identity group differences in demographic, psychosocial factors, and sleep quality while controlling for both age and



**Table 2.** Summary of descriptive statistics separated by group.

Variable	Cishet [ <i>n</i> = 199]	LGBTQ+ [ <i>n</i> = 74]
Generalized Stress	4.37(3.82; 0–17)	7.62(4.92; 0–19)*
Sleep Quality	7.04(3.77; 1–19)	8.87(4.02; 1–18)*
Sleep Hygiene	18.10(8.11; 0–41)	21.58(7.31; 7–41)*
COVID-19 Stress	3.44(2.54; 0–10)	5.54(3.13; 0–13)*
Social Network Size	6.61(4.86; 0–35)	5.11(4.84; 0–35)*

Note. Mean (SD; Range of Participant Scores); \* $p < 0.05$ .

education level using ANCOVAs. LGBTQ+ adults reported higher generalized stress ( $F(1,271) = 19.61$ ,  $\eta_p^2 = 0.07$ ,  $p = <0.001$ ) and higher COVID-19-related stress ( $F(1,271) = 21.12$ ,  $\eta_p^2 = 0.07$ ,  $p = <0.001$ ), as well as smaller social network sizes ( $F(1,271) = 22.45$ ,  $\eta_p^2 = 0.07$ ,  $p = <0.001$ ) compared to cishet adults. LGBTQ+ adults reported significantly worse sleep quality than cishet adults ( $F(1,271) = 9.10$ ,  $\eta_p^2 = 0.03$ ,  $p = 0.002$ ) and worse sleep hygiene ( $F(1,271) = 3.09$ ,  $\eta_p^2 = 0.07$ ,  $p = <0.001$ ). See Table 2 for a summary of descriptive statistics by group. For each of these models, group remained significant while accounting for both covariates, age and years of education were not included in the subsequent analyses.

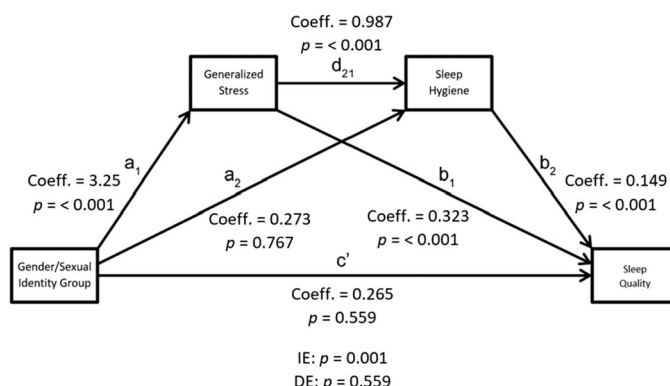
### **No differences in the minority stress level of LGBTQ+ participants**

The results of the Pearson's correlation indicated that there was no significant relationship between minority stress (DHEQ) and PSQI in the LGBTQ+ group, ( $R^2(74) = 0.182$ ,  $p = 0.121$ ). Consequently, no further analyses were conducted using minority stress.

### **Generalized stress and sleep hygiene mediate group differences in sleep quality**

To assess the extent to which generalized stress and sleep hygiene explain group differences in sleep quality, we conducted a serial mediation analysis, as depicted in Figure 1. The overall regression model predicting sleep quality, with group, generalized stress, and sleep hygiene predictors, was significant and accounted for 36% of the variance in sleep quality, as seen in Table 3. There was a significant indirect effect between group and sleep quality through generalized stress (indirect effect (IE): estimate = 1.53, SE = 0.296,  $p < 0.001$ ; direct effect (DE): estimate = 0.305, SE = 0.479,  $p = 0.52$ ). The indirect path between group and sleep quality through both generalized stress and sleep hygiene was also significant (IE: estimate = 0.480, SE = 0.139,  $p = 0.001$ ; DE: estimate = 0.265, SE = 0.453,  $p = 0.56$ ). There was a partial indirect pathway between group and sleep quality including only sleep hygiene (IE: estimate = 0.826, SE = 0.263,  $p = 0.002$ ; DE: estimate = 1.01, SE = 0.497,  $p = 0.042$ ). Note that there was no significant direct pathway between group and either sleep hygiene or sleep quality which is noted in Table 3.





**Figure 1.** Serial mediation model with group predicting sleep quality with generalized stress and sleep hygiene as mediators.

Note. Coeff. = standardized estimate; IE=indirect effect; DE=direct effect.

**Table 3.** Regression coefficients and standard errors for the serial mediation model presented in Figure 1.

		Stress				SHI				Sleep Quality		
		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p
Group	$a_1$	3.25	0.635	<.001	$a_2$	0.273	0.920	0.767	$c'$	0.265	0.453	0.559
Stress	—	—	—	—	$d_{12}$	0.987	0.098	<.001	$b_1$	0.323	0.038	<.001
SHI	—	—	—	—	—	—	—	—	$b_2$	0.149	0.031	<.001
		$R^2 = 0.11$			$R^2 = 0.30$			$R^2 = 0.36$				
		$F(1, 271) = 33.1$			$F(2, 270) = 56.7$			$F(3, 269) = 49.8$				
		$p < 0.001$			$p < 0.001$			$p < 0.001$				

### COVID-19 stress and social support do not impact group differences in sleep quality

Moderation analyses were conducted to assess the roles of social network size and COVID-19 stress as possible protective or exacerbating factors in the relationship between generalized stress and sleep quality. COVID-19 stress was marginally predictive of sleep quality, after controlling for generalized stress ( $\beta = 0.11$ ,  $p = 0.058$ ) but did not moderate the relationship between generalized stress and sleep quality ( $\beta = -0.14$ ,  $p = 0.15$ ). Social network size was not predictive of sleep quality,  $p = 0.258$  nor did it moderate the relationship between generalized stress and sleep quality,  $p = 0.66$  (Table 4).

### Discussion

In the past, research regarding the LGBTQ+ community has been concerned with identifying differences between LGBTQ+ and cis/het populations. Whether it be identifying differences in sleep, physical health, mental health, etc. the question is typically focused on simply identifying a difference between communities. However, little to no research has examined how or why these differences occur beyond the scope of minority stress.

**Table 4.** Regression analyses results for moderation analysis using COVID-19 stress & social network size as moderators.

Variable	<i>B</i>	<i>SE B</i>	$\beta$	<i>R</i> <sup>2</sup>	$\Delta R^2$
PSQI Total					
Model 1				0.04	–
Group	1.83***	0.52	0.21***		
Model 2				0.29	0.25
Group	0.31	0.48	0.03		
Stress	0.47***	0.05	0.53***		
Model 3				0.31	0.02
Group	0.19	0.49	0.02		
Generalized Stress	0.54***	0.09	0.60***		
COVID-19 Stress	0.15 <sup>†</sup>	0.08	0.11 <sup>†</sup>		
Generalized Stress*COVID-19	–0.02	0.02	–0.14		
Model 4				0.31	<0.01
Group	0.17	0.49	0.02		
Generalized Stress	0.57***	0.11	0.64***		
COVID-19 Stress	0.15	0.08	0.11		
Social Network	–0.04	0.04	–0.05		
Generalized Stress*COVID-19	–0.02	0.02	–0.15		
Generalized Stress*Social Network	–0.01	0.01	–0.04		

Note. <sup>†</sup>*p* ~ 0.05; \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

On the other hand, in sleep research, there is abundant literature examining how sleep is modulated by outside factors such as sleep hygiene, stress level, etc. in a general population, but little to none of this research is applied to LGBTQ+ populations. Each form of research has a significant gap in the literature that is solved by examining the literature from the other. LGBTQ+ research has identified differences between populations but has little explanation as to why and/or how these differences occur and general sleep research has an explanation without an application. However, there has been no research attempting to connect these two areas of research and fill their respective gaps in the literature. The current study aims to fill these gaps by being, to the best of our knowledge, the first to examine multiple potential psychosocial and lifestyle factors, outside of minority stress, that might explain the relationship between sexual/gender identity and sleep quality.

We found that LGBTQ+ participants reported worse sleep quality, higher levels of generalized stress and COVID-19 stress, and smaller social networks than their cishet peers. We also found that generalized stress fully explained the relationship between group and sleep quality, while sleep hygiene partially explained the relationship between increased generalized stress and poor sleep quality. Social network size does not blunt the association between higher generalized stress and poorer sleep quality, across groups. Nor does COVID-19 stress exacerbate this negative association between higher generalized stress and poorer sleep quality across groups. We discuss these results below.

In our sample, LGBTQ+ adults reported worse sleep quality than their cishet peers, which is consistent with the current literature (Galinsky et al.,

2018; Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). Two mechanisms were found to help explain this relationship in this study. The first is the increased generalized stress observed in the LGBTQ+ compared to cishet participants. Specifically, the results showed that generalized stress acted as a complete mediator of the relationship between group and sleep quality. This implies that LGBTQ+ are experiencing more stress-related sleep reductions like those suggested in studies such as Kim and Dimsdale (2007) and Åkerstedt et al. (2012). However, unexpectedly, the relationship between sexual/gender identity and sleep quality cannot be explained by minority stress. Although minority stress was higher in the LGBTQ+ group, it was not predictive of worse sleep quality in this group, which is inconsistent with the literature where prior studies partially attribute sleep disparities to the effects of minority stress (Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). The current study was not meant to completely separate the impact minority stress has on generalized stress. Indeed, these measures of stress were correlated in the LGBTQ+ subjects. Instead, what the current analyses show is that minority stress as measured with the DHEQ did not explain unique variance in sleep quality in the current sample. It is perhaps noteworthy that these data were collected during months of the COVID-19 pandemic in which people were still meant to be limiting social interaction, and remote schooling and work were still common. Thus, individuals in this study may have been exposed to fewer social interactions triggering minority stress. Future investigations should be conducted to evaluate this possibility. One possible reason for the lack of a significant relationship in the current study is the relatively small sample size of our LGBTQ+ group ( $n = 74$ ). It is also possible that, because subjects were enrolled during the COVID-19 pandemic when many people were limiting their interactions with others, the negative impact of minority stress on health outcomes, including sleep, was reduced. Unfortunately, we did not collect data on the number and frequency of social interactions making it difficult to disambiguate between these possibilities.

Poorer sleep hygiene partially explained the relationship between generalized stress and poorer sleep quality. Good sleep hygiene has been linked to increased sleep quality and lower generalized stress in adults (Anwer et al., 2019; Getachew et al., 2020; Wade et al., 2021). As LGBTQ+ participants reported worse sleep hygiene than their cishet peers, these poor habits, in turn, partially contributed to the negative effect that increased generalized stress had on sleep quality. The literature has suggested that members of the LGBTQ+ community are more susceptible to mental health disorders such as anxiety or depression, which could be a possible explanation for the differences in sleep hygiene that are seen between the groups (Cochran et al., 2003; Cochran & May, 2007; Conron et al., 2010).

COVID-19-related stress and social network size had no significant effect on the relationship between generalized stress and sleep quality. In the emerging literature, stress during COVID-19 has been linked to increased sleep problems (Jahrami et al., 2021; Alimoradi et al., 2021). However, in the present study, we found that COVID-19 stress, after controlling for generalized stress, showed only a marginal direct relationship with sleep quality and did not exacerbate the relationship between generalized stress and sleep quality. There could be a variety of factors impacting this result. For example, this study was conducted in the spring of 2021, meaning that people had a year to adapt to the new environment COVID-19 provided as society entered a “new normal.” The largest factor for a low impact of COVID-19 stress is most likely that generalized stress was controlled for in the current study, and a clear distinction was made between stress associated with the COVID-19 pandemic and generalized stress. This distinction was not made in previous studies.

Prior studies have linked greater social support to better sleep quality, however, we found no protective effect of social network size in the current study (Morin et al., 2003). In the literature, social support is typically seen as a positive factor, decreasing generalized stress and improving sleep quality, however, it must be considered that one’s social network can act as a negative influence through means such as “positive” stigma, pity, overreacting, confrontation, etc. and could lead to social isolation (Palant & Himmel, 2019). This is especially important to note when dealing with vulnerable groups such as the LGBTQ+ community where perceived support can be positively or negatively associated with suicide risk, and well-being, with low perceived support being associated with increased depression, shame, and isolation (Chow & Cheng, 2010; Wright & Perry, 2006). These conflicting effects along with a small sample size may have impacted results. They may also explain why we found no protective effects of social network size on sleep quality. Also, at the time of the study social distancing was in place and may have impacted participants’ views on the nature of social support/social network size.

### ***Strengths, limitations, and future directions***

The current study has several strengths. It is one of the first studies to investigate multiple psychosocial/lifestyle factors, outside of minority stress, that might contribute to or ameliorate poor sleep quality in LGBTQ+ adults. Seeing that there is such a severe lack of literature investigating the links between all aspects of the current study—sexual/gender minority status, sleep quality, stress, and various psychosocial factors—together, this study helps lay the groundwork for future studies investigating these links.

However, this study is not without its limitations. The sample sizes used in this study were small, particularly in our LGBTQ+ group, which may have contributed to the minimal relationship between minority stress and sleep quality, which has been shown in prior studies (Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). The same could be said about differences in specific subgroups such as transgender/gender non-conforming versus cisgender participants. It is possible that minority stress could be higher and play a larger role in sleep health in these subgroups. However, due to the small sample size of these groups, we did not want to draw any conclusions or overgeneralize. Lastly, this was a cross-sectional study. We cannot determine the temporal relationship between stress and sleep quality. However, previous longitudinal studies suggest that prior stress can lead to poor sleep quality in adults (Åkerstedt et al., 2012).

There is also a lack of literature using objective measures of sleep quality in LGBTQ+ populations (i.e., actigraphy, PSG), which is detailed in the review by Butler et al. (2020). Due to the risk of people under-reporting their sleep difficulties when using self-report measures such as findings in Jackson et al. (2018), future research should also employ objective sleep measurements in addition to self-reported sleep measures. These multimodal measures would allow for a more comprehensive understanding of sleep health. The current research was limited by the broadness of variables increasing the difficulty of making associations due to their multi-dimensional nature. Future studies would benefit by increasing the specificity of variables or examining the specific intersections between sexual/gender identity and variables, such as race, body image, bullying, victimization, and lingering trauma, in relation to sleep quality and would add greatly to the field of psychological and physical well-being in LGBTQ+ research.

Poor sleep quality in LGBTQ+ people compared to cisgender people has been consistently found in the literature (Galinsky et al., 2018; Kolp et al., 2020; Li et al., 2017; Martin-Storey et al., 2018). However, the underlying mechanisms explaining this group difference along with possible protective and exacerbating factors impacting this relationship remain elusive. The present study found that increased generalized stress fully explained the relationship between group and sleep quality while poor sleep hygiene partially explained the relationship between increased generalized stress and poor sleep quality. However, we found no protective or exacerbating factors moderating the relationship between stress and sleep in LGBTQ+ or cisgender adults. Considering the impact sleep can have on cognition and overall health and the vulnerability of the LGBTQ+ community, future research should aim to look at possible sleep habit interventions and other protective factors against high stress and poor sleep quality.

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## Disclosure statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Ethics statement

This research study was approved by the Georgia Institute of Technology Institutional Review Board (IRB).

## Open Scholarship



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## Data availability statement

The data that support the findings of this study are available from the corresponding author, Jess Campbell, upon reasonable request.

## References

- Åkerstedt, T., Orsini, N., Petersen, H., Axelsson, J., Lekander, M., & Kecklund, G. (2012). Predicting sleep quality from stress and prior sleep—A study of day-to-day covariation across six weeks. *Sleep Medicine*, 13(6), 674–679. <https://doi.org/10.1016/j.sleep.2011.12.013>
- Alimoradi, Z., Broström, A., Tsang, H. W. H., Griffiths, M. D., Haghayegh, S., Ohayon, M. M., Lin, C.-Y., & Pakpour, A. H. (2021). Sleep problems during COVID-19 pandemic and its' Association to Psychological Distress: A systematic review and meta-analysis. *EClinicalMedicine*, 36, 100916. <https://doi.org/10.1016/j.eclinm.2021.100916>

- Anwer, S., Alghadir, A., Manzar, M. D., Noohu, M. M., Mohammed, S., & Li, H. (2019). Psychometric analysis of the sleep hygiene index and correlation with stress and anxiety among Saudi University students. *Nature and Science of Sleep*, 11, 325–332. volume <https://doi.org/10.2147/nss.s222440>
- Balsam, K. F., Beadnell, B., & Molina, Y. (2013). The daily heterosexist experiences questionnaire. *Measurement and Evaluation in Counseling and Development: The Official Publication of the Association for Measurement and Evaluation in Counseling and Development*, 46(1), 3–25. <https://doi.org/10.1177/0748175612449743>
- Butler, E. S., McGlinchey, E., & Juster, R. P. (2020). Sexual and gender minority sleep: A narrative review and suggestions for future research. *Journal of Sleep Research*, 29(1). <https://doi.org/10.1111/jsr.12928>
- Buyse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and Research. *Psychiatry Research*, 28(2), 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Calvete, E., & Connor-Smith, J. K. (2006). Perceived social support, coping, and symptoms of distress in American and Spanish students. *Anxiety, Stress & Coping*, 19(1), 47–65. <https://doi.org/10.1080/10615800500472963>
- Chang, C. J., Kellerman, J. K., Fehling, K. B., Feinstein, B. A., & Selby, E. A. (2021). The roles of discrimination and social support in the associations between outness and mental health outcomes among sexual minorities. *American Journal of Orthopsychiatry*, 91(5), 607–616. <https://doi.org/10.1037/ort0000562>
- Chaput, J.-P., Dutil, C., Featherstone, R., Ross, R., Giangregorio, L., Saunders, T. J., Janssen, I., Poitras, V. J., Kho, M. E., Ross-White, A., Zankar, S., & Carrier, J. (2020). Sleep timing, sleep consistency, and health in adults: A systematic review. *Applied Physiology, Nutrition, and Metabolism*, 45(10 (Suppl. 2)), S232–S247. <https://doi.org/10.1139/apnm-2020-0032>
- Chow, P. K.-Y., & Cheng, S.-T. (2010). Shame, internalized heterosexism, lesbian identity, and coming out to others: A comparative study of lesbians in Mainland China and Hong Kong. *Journal of Counseling Psychology*, 57(1), 92–104. <https://doi.org/10.1037/a0017930>
- Cochran, S. D., & Mays, V. M. (2007). Physical Health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: Results from the California Quality of Life Survey. *American Journal of Public Health*, 97(11), 2048–2055. <https://doi.org/10.2105/ajph.2006.087254>
- Cochran, S. D., Sullivan, J. G., & Mays, V. M. (2003). Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *Journal of Consulting and Clinical Psychology*, 71(1), 53–61. <https://doi.org/10.1037/0022-006x.71.1.53>
- Conron, K. J., Mimiaga, M. J., & Landers, S. J. (2010). A population-based study of sexual orientation identity and gender differences in adult health. *American Journal of Public Health*, 100(10), 1953–1960. <https://doi.org/10.2105/ajph.2009.174169>
- Galinsky, A. M., Ward, B. W., Joestl, S. S., & Dahlhamer, J. M. (2018). Sleep duration, sleep quality, and sexual orientation: Findings from the 2013–2015 National Health Interview Survey. *Sleep Health*, 4(1), 56–62. <https://doi.org/10.1016/j.sleh.2017.10.004>
- Getachew, Y., Azale, T., & Necho, M. (2020). Poor sleep quality and associated factors among prisoners of the Diredawa Correctional Facility in eastern Ethiopia. *Annals of General Psychiatry*, 19(1). <https://doi.org/10.1186/s12991-020-00291-6>
- Jackson, C. L., Patel, S. R., Jackson, W. B., Lutsey, P. L., & Redline, S. (2018). Agreement between self-reported and objectively measured sleep duration among white, black, Hispanic, and Chinese adults in the United States: Multi-ethnic study of Atherosclerosis. *Sleep*, 41(6). <https://doi.org/10.1093/sleep/zsy057>



- Jahrami, H., BaHammam, A. S., Bragazzi, N. L., Saif, Z., Faris, M. A. I., & Vitiello, M. V. (2021). Sleep problems during the covid-19 pandemic by population: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine: JCSM: Official Publication of the American Academy of Sleep Medicine*, 17(2), 299–313. <https://doi.org/10.5664/jcsm.8930>
- Kim, E.-J., & Dimsdale, J. E. (2007). The effect of psychosocial stress on sleep: A review of polysomnographic evidence. *Behavioral Sleep Medicine*, 5(4), 256–278. <https://doi.org/10.1080/15402000701557383>
- Kolp, H., Wilder, S., Andersen, C., Johnson, E., Horvath, S., Gidycz, C. A., & Shorey, R. (2020). Gender minority stress, sleep disturbance, and sexual victimization in transgender and gender nonconforming adults. *Journal of Clinical Psychology*, 76(4), 688–698. <https://doi.org/10.1002/jclp.22880>
- Krueger, E. A., Meyer, I. H., & Upchurch, D. M. (2018). Sexual orientation group differences in perceived stress and depressive symptoms among young adults in the United States. *LGBT Health*, 5(4), 242–249. <https://doi.org/10.1089/lgbt.2017.0228>
- Li, P., Huang, Y., Guo, L., Wang, W., Xi, C., Lei, Y., Luo, M., Pan, S., Deng, X., Zhang, W.-H., & Lu, C. (2017). Is sexual minority status associated with poor sleep quality among adolescents? Analysis of a national cross-sectional survey in Chinese adolescents. *BMJ Open*, 7(12), e017067. <https://doi.org/10.1136/bmjopen-2017-17067>
- Lovibond, S. H., Lovibond, P. F., & Psychology Foundation of Australia. (1995). *Manual for the depression anxiety stress scales* (2nd ed.). Psychology Foundation of Australia.
- Martin-Storey, A., Prickett, K. C., & Crosnoe, R. (2018). Disparities in sleep duration and restedness among same- and different-sex couples: Findings from the American Time Use Survey. *Sleep*, 41(8), zsy090. <https://doi.org/10.1093/sleep/zsy090>
- Mastin, D. F., Bryson, J., & Corwyn, R. (2006). Assessment of sleep hygiene using the sleep hygiene index. *Journal of Behavioral Medicine*, 29(3), 223–227. <https://doi.org/10.1007/s10865-006-9047-6>
- McDonald, K. (2018). Social support and mental health in LGBTQ adolescents: A review of the literature. *Issues in Mental Health Nursing*, 39(1), 16–29. <https://doi.org/10.1080/01612840.2017.1398283>
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674–697. <https://doi.org/10.1037/0033-2909.129.5.674>
- Moran, T. E., Chen, C. Y.-C., & Tryon, G. S. (2018). Bully victimization, depression, and the role of protective factors among college LGBTQ students. *Journal of Community Psychology*, 46(7), 871–884. <https://doi.org/10.1002/jcop.21978>
- Morin, C. M., Rodrigue, S., & Ivers, H. (2003). Role of stress, arousal, and coping skills in primary insomnia. *Psychosomatic Medicine*, 65(2), 259–267. <https://doi.org/10.1097/01.psy.0000030391.09558.a3>
- Palant, A., & Himmel, W. (2019). Are there also negative effects of social support? A qualitative study of patients with inflammatory bowel disease. *BMJ Open*, 9(1), e022642. <https://doi.org/10.1136/bmjopen-2018-022642>
- Pearson, J., & Wilkinson, L. (2013). Family relationships and adolescent well-being: Are families equally protective for same-sex attracted youth? *Journal of Youth and Adolescence*, 42(3), 376–393. <https://doi.org/10.1007/s10964-012-9865-5>
- Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social Science & Medicine* (1982), 32(6), 705–714. [https://doi.org/10.1016/0277-9536\(91\)90150-b](https://doi.org/10.1016/0277-9536(91)90150-b)
- Wade, R., Pachana, N. A., & Dissanayaka, N. (2021). Factors related to sleep disturbances for informal caregivers of individuals with PD and dyadic relationship: A rural perspective. *Journal of Geriatric Psychiatry and Neurology*, 34(5), 389–396. <https://doi.org/10.1177/0891988720944250>

- Wright, E. R., & Perry, B. L. (2006). Sexual identity distress, social support, and the health of gay, lesbian, and bisexual youth. *Journal of Homosexuality*, 51(1), 81–110. [https://doi.org/10.1300/j082v51n01\\_05](https://doi.org/10.1300/j082v51n01_05)
- Xu, W., Tan, C.-C., Zou, J.-J., Cao, X.-P., & Tan, L. (2020). Sleep problems and risk of all-cause cognitive decline or dementia: An updated systematic review and meta-analysis. *Journal of Neurology, Neurosurgery, and Psychiatry*, 91(3), 236–244. <https://doi.org/10.1136/jnnp-2019-321896>
- Yip, T., Feng, Y., Fowle, J., & Fisher, C. B. (2021). Sleep disparities during the covid-19 pandemic: An investigation of AIAN, Asian, Black, Latinx, and White young adults. *Sleep Health*, 7(4), 459–467. <https://doi.org/10.1016/j.sleh.2021.05.008>