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# COVID-19-Related News Consumption Linked with Stress and Worry, but Not Sleep Quality, Early in the Pandemic

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## ABSTRACT

Beginning in early 2020, the novel coronavirus was the subject of frequent and sustained news coverage. Building on prior literature on the stress-inducing effects of consuming news during a large-scale crisis, we used network analysis to investigate the association between coronavirus disease 2019 (COVID-19) news consumption, COVID-19-related psychological stress, worries about oneself and one's loved ones getting COVID-19, and sleep quality. Data were collected in March 2020 from 586 adults (45.2% female; 72.9% White) recruited via Amazon Mechanical Turk in the U.S. Participants completed online surveys assessing attitudes and behaviors related to COVID-19 and a questionnaire assessing seven domains of sleep quality. Networks were constructed using partial regularized correlation matrices. As hypothesized, COVID-19 news consumption was positively associated with COVID-19-related psychological stress and concerns about one's loved ones getting COVID-19. However, there were very few associations between COVID-19 news consumption and sleep quality indices, and gender did not moderate any of the observed relationships. This study replicates and extends previous findings that COVID-19-news consumption is linked with psychological stress related to the pandemic, but even under such conditions, sleep quality can be spared due to the pandemic allowing for flexibility in morning work/school schedules.

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## KEYWORDS

Pandemic; sleep; stress; network analysis

The coronavirus disease 2019 (COVID-19) pandemic has caused uncertainty and distress since its onset in early 2020 (Vindegard & Benros, 2020). In March 2020, the World Health Organization declared COVID-19 a pandemic and the U.S. government declared COVID-19 a national emergency (Cucinotta & Vanelli, 2020). Since then, both coverage and consumption of pandemic-related news have become near-constant (e.g., Masip et al., 2021), with news coverage levels approximating that for World War II (The Economist; 2020). However, the psychological effects of increased news consumption during the pandemic are not entirely clear (e.g., Alfuqaha et al., 2022). While the news provides people with valuable information on government policies, health guidelines, and coping strategies, not all COVID-19-related

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news consumption is necessarily helpful. Consuming too much pandemic-related news can lead to information overload (Masip et al., 2021), which may increase anxiety (Bodas et al., 2015) and worsen sleep problems (Exelmans & Van den Bulck, 2017).

## **Pandemic-related News, Psychological Stress and Sleep Quality**

Research has shown that consuming news coverage of large-scale crises can trigger psychological stress (Holman et al., 2020). Indeed, early news coverage of COVID-19 often provided the public with conflicting information (Nagler et al., 2020), which can be cognitively taxing (Barnwell et al., 2022). Some research has found greater news consumption to be associated with greater psychological distress, particularly when people perceived that COVID-19 threatened their health and/or economic well-being (Stainback et al., 2020). Here, we sought to examine whether COVID-19-related news exposure would be associated with greater psychological stress, as well as concerns about oneself or one's family getting COVID-19.

Excessive COVID-19 news consumption is also thought to interfere with sleep, likely via increased stress and worry (Crew et al., 2020; Simpson & Manber, 2020). One study found that increased consumption of COVID-19-related news was negatively associated with sleep quality, and that this relationship was stronger in individuals with greater depression, anxiety, and general stress (Hussein Oglu, 2021). However, this study did not measure psychological stress related to COVID-19 in particular, or anxiety about oneself or one's loved ones getting COVID-19, which may also be important factors related to whether and how someone seeks out COVID-19 related news.

## **The Moderating Role of Gender**

The relationships between COVID-19 news consumption, COVID-19 worries, and sleep quality may be more pronounced among women than men. In general, women are 41%–58% more likely to experience insomnia than men (Zeng et al., 2020; Zhang & Wing, 2006). Thus, gender may serve as a 'predisposing' factor (or a diathesis) for the development of subsequent sleep problems in the face of a stressor, such as the pandemic (Cox & Olatunji, 2021). Indeed, some evidence indicates that, relative to men, women experienced greater COVID-19-related emotional distress (Naeim et al., 2021), were more psychologically impacted by COVID-19 (e.g., Liu et al., 2020; Wang et al., 2020), and more frequently consumed news related to COVID-19 (Masip et al., 2021). This heightened distress may underlie the pronounced sleep problems in women compared with men during the pandemic (e.g., Beck et al., 2021a).

## **The Present Study**

We investigated how COVID-19-related news consumption is cross-sectionally associated with psychological stress, worries about oneself or one's loved ones contracting COVID-19, and sleep quality in a sample of 586 adults from the U.S. This study was aptly timed to examine these relationships, given that data were collected at the onset of lockdown orders in the U.S. when there was substantial uncertainty related to the virus, coupled with a lack of testing and clear safety recommendations. Importantly, we used network analysis to examine how COVID-19-related news consumption was

associated with stress, worries, and sleep quality early in the pandemic. This method has not been previously applied to test this question.<sup>1</sup>

Four a priori hypotheses were preregistered (<https://osf.io/kd3ye>). Hypothesis 1: Greater COVID-19-related news consumption is associated with greater psychological stress. If supported, this would bolster prior research finding a link between COVID-19 news consumption and stress, given that the network analysis method involves a more stringent test than the regression-based methods used in prior studies. Hypothesis 2: Greater COVID-19-related news consumption is associated with greater worry about oneself getting COVID-19 (Hypothesis 2A) and greater worry about one's family and friends getting COVID-19 (Hypothesis 2B). Hypothesis 3: Greater COVID-19 news consumption is linked to poorer sleep quality across a range of domains (i.e., subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction). Hypothesis 4: These relationships would be stronger among women than men. To test hypotheses 1–3, we estimated a psychometric network, which included the full sample. To test hypothesis 4, we used a bootstrapping procedure to examine whether gender moderated any relationships across the full network.

## Method

### *Participants and Procedure*

This is a secondary analysis of openly available cross-sectional data (Gao & Scullin, 2020; <https://osf.io/ey3fz/>) that were collected in the early weeks of the COVID-19 pandemic lockdown (late March 2020). The Baylor University Institutional Review Board approved all study procedures. The convenience sample consisted of 586 adults in the U.S. Participants provided written informed consent and completed the study procedures via Amazon Mechanical Turk for monetary compensation (up to \$2). During the study, there were embedded attentional checks to ensure that participants were not bots and were putting forth good effort and concentration while completing the questionnaires. Participants who did not pass these tests were excluded from data analysis. For more information, see the parent study (Scullin et al., 2021).

## Measures

### *Demographic variables*

Demographic data were collected as part of the survey and summarized in Table 1.

### *COVID-19 variables*

COVID-19-related variables included whether individuals' local governments had issued shelter-in-place orders and whether participants had tested positive for COVID-19. Participants also reported the extent to which they agreed or disagreed with a series of statements related to COVID-19 on Likert-scales from 1 ('Strongly disagree') to 6 ('Strongly agree') ( $\alpha = .80$ ). Variables that were used for the present investigation included COVID-19-related news consumption (i.e., '*I read a lot of news about COVID-19*'); COVID-19-related psychological stress (i.e., '*The COVID-19 pandemic has caused a lot of psychological stress to me*'); worry about oneself contracting COVID-19 (i.e., '*I worry about getting COVID-19*'); and

**Table 1.** Demographic characteristics for N = 586 participants.

|                                |             |
|--------------------------------|-------------|
| Gender                         |             |
| Female                         | 265 (45.2%) |
| Male                           | 321 (54.8%) |
| Nonbinary                      | 0           |
| Age                            |             |
| Mean                           | 38.8        |
| SD                             | 12.0        |
| Range                          | 18–74       |
| Race/ethnicity                 |             |
| White                          | 427 (72.9%) |
| African American               | 71 (12.1%)  |
| Asian                          | 38 (6.5%)   |
| Hispanic                       | 32 (5.5%)   |
| American Indian/Alaskan Native | 6 (1.0%)    |
| Other                          | 12 (2.0%)   |
| Professional Status            |             |
| Employed                       | 523 (89.2%) |
| Unemployed                     | 61 (10.4%)  |
| Health Status                  |             |
| Poor                           | 10 (1.7%)   |
| Fair                           | 57 (9.7%)   |
| OK                             | 143 (24.4%) |
| Good                           | 289 (49.3%) |
| Excellent                      | 85 (14.5%)  |

worry about loved ones contracting COVID-19 (i.e., ‘*I worry about my family members and friends getting COVID-19*’). Using factor analysis with varimax rotation, the COVID-19 news consumption item was loaded onto one factor, while the latter three items were loaded onto a separate factor (Gao & Scullin, 2020).

### **Sleep quality**

The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) was used to assess sleep quality during the past month. The PSQI yields seven component scores (all ranging from 0 to 3) for different sleep quality domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction ( $\alpha = .70$ ). On each component, higher scores correspond with worse sleep quality.

### **Analytic Plan**

#### **Data preparation**

Data were checked for missingness on the basis of several demographic characteristics (e.g., age, health status) using *t*-tests and ANOVAs. Because data appeared to be missing at random, multivariate imputation via the mice package (Van Buuren & Groothuis-Oudshoorn, 2011), with a specification for ordinal data, was used to obtain a complete dataset (see *Missing Data*, below).

#### **Gender differences on study variables**

We examined whether scores on study variables differed across genders using a series of cumulative link models for ordinal regression with the ordinal package in R (Christensen, 2015), with gender as a categorical predictor of each study variable.

## Network analyses

In a psychometric network, relationships among variables are typically estimated using partial correlations and with statistical regularization to eliminate spurious associations. Depending on the level of regularization, correlations that are near-zero will typically be eliminated from a network. This increases the simplicity of interpreting the model and the likelihood that the observed associations are true (Epskamp & Fried, 2018). Furthermore, unlike simple correlations, network analysis allows for the identification of the most ‘important’ nodes in a network (e.g., by examining how strong each node’s associations are with all other nodes).

Regularized partial correlation networks with polychoric correlations were constructed using the bootnet package (Epskamp et al., 2018) in R version 4.1.1 (R Core Team, 2021). Edge weights in a partial correlation network correspond with the estimated correlation coefficients between each variable, after controlling for all other variables in the network. The graphical least absolute shrinkage and selection operator (GLASSO; Friedman et al., 2014) with an Extended Bayesian Information Criterion (EBIC) was used to minimize spurious connections in the network. To determine the optimal tuning parameter, model estimates were calculated across several EBIC hyperparameter gamma ( $\gamma$ ) values. A  $\gamma$  value of 0.5 would be more stringent, leading to a sparser graph, while a  $\gamma$  value of 0 (i.e., no regularization) would allow more spurious edges to remain. Given the many weak edges visible on the unregularized graph,  $\gamma$  was set to 0.5 to be more conservative. To avoid over-regularization and potentially missing meaningful associations in the network, the threshold argument which controls the level of sparsity in the network (lambda;  $\lambda$ ) was set to ‘FALSE’. Network plotting was done using the R package qgraph (Epskamp et al., 2012).

Finally, several network centrality metrics were estimated to characterize the relative importance of nodes across the network, including strength centrality, expected influence centrality, and betweenness centrality. Strength centrality refers to the sum of the edge weights between a node and its neighbors. The expected influence centrality is mathematically similar to strength centrality but differentiates positive and negative correlations between nodes (Robinaugh et al., 2016). If all edges in a network were positive, then strength and expected influence would be the same. Betweenness centrality refers to the frequency with which a node lies on the shortest paths connecting other nodes in the network. For instance, removing nodes with high betweenness can result in more difficulty with conceptually ‘traversing’ the network.

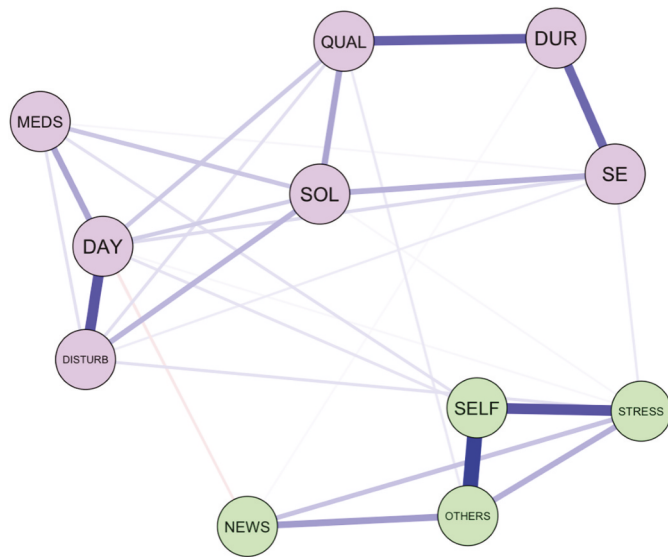
## Results

### Missing Data

We identified 79 missing data points ( $79/6,446 = 1.2\%$  missing observations in total across the 11 variables). Participants’ missing responses were not significantly related to age ( $t = -0.92$ ,  $p = .36$ ), employment status ( $t = .82$ ,  $p = .42$ ), gender ( $t = .75$ ,  $p = .46$ ), race/ethnicity ( $F = 1.40$ ,  $p = .22$ ) or health status ( $F = 1.03$ ,  $p = .39$ ). Thus, the data appeared to be missing at random. Table 2 presents the distributions of COVID-19 and sleep quality variables.

**Table 2.** Means and standard deviations for key study variables.

| Node label | Description                           | Range | Mean (SD) for full sample | Mean (SD) for females | Mean (SD) for males |
|------------|---------------------------------------|-------|---------------------------|-----------------------|---------------------|
| NEWS       | COVID-19 news consumption             | 1–6   | 4.90 (1.18)               | 5.03 (1.09)           | 4.80 (1.23)         |
| STRESS     | COVID-19-related psychological stress | 1–6   | 3.82 (1.55)               | 4.09 (1.47)           | 3.60 (1.59)         |
| OTHERS     | Worry about others getting COVID-19   | 1–6   | 4.33 (1.46)               | 4.56 (1.42)           | 4.13 (1.48)         |
| SELF       | Worry about oneself getting COVID-19  | 1–6   | 3.77 (1.54)               | 3.94 (1.53)           | 3.63 (1.55)         |
| QUAL       | Subjective sleep quality (PSQI-1)     | 0–3   | 0.97 (0.70)               | 1.07 (0.71)           | 0.89 (0.68)         |
| SOL        | Sleep onset latency (PSQI-2)          | 0–3   | 1.13 (0.99)               | 1.13 (1.03)           | 1.13 (0.96)         |
| DUR        | Sleep duration (PSQI-3)               | 0–3   | 0.77 (0.73)               | 0.80 (0.78)           | 0.74 (0.69)         |
| SE         | Habitual sleep efficiency (PSQI-4)    | 0–3   | 0.47 (0.89)               | 0.52 (0.92)           | 0.43 (0.87)         |
| DISTURB    | Sleep disturbances (PSQI-5)           | 0–3   | 1.29 (0.69)               | 1.31 (0.64)           | 1.27 (0.73)         |
| MEDS       | Use of sleeping medication (PSQI-6)   | 0–3   | 0.62 (1.00)               | 0.73 (1.07)           | 0.54 (0.93)         |
| DAY        | Daytime dysfunction (PSQI-7)          | 0–3   | 0.80 (0.81)               | 0.82 (0.80)           | 0.79 (0.82)         |



**Figure 1.** Graphical LASSO network for the full sample ( $N = 586$ ). Note. The Pittsburgh Sleep Quality Index items are purple; COVID-19 questionnaire items are green. Blue edges = positive correlations; red edges = negative correlations. Edge thickness reflects the magnitude of a correlation. NEWS = COVID-19 news consumption; STRESS = COVID-19 related psychological stress; OTHERS = worry about others getting COVID-19; SELF = worry about oneself getting COVID-10; QUAL = subjective sleep quality; SOL = sleep latency; DUR = sleep duration; SE = habitual sleep efficiency; DISTURB = sleep disturbances; MEDS = use of sleeping medication; DAY = daytime dysfunction.

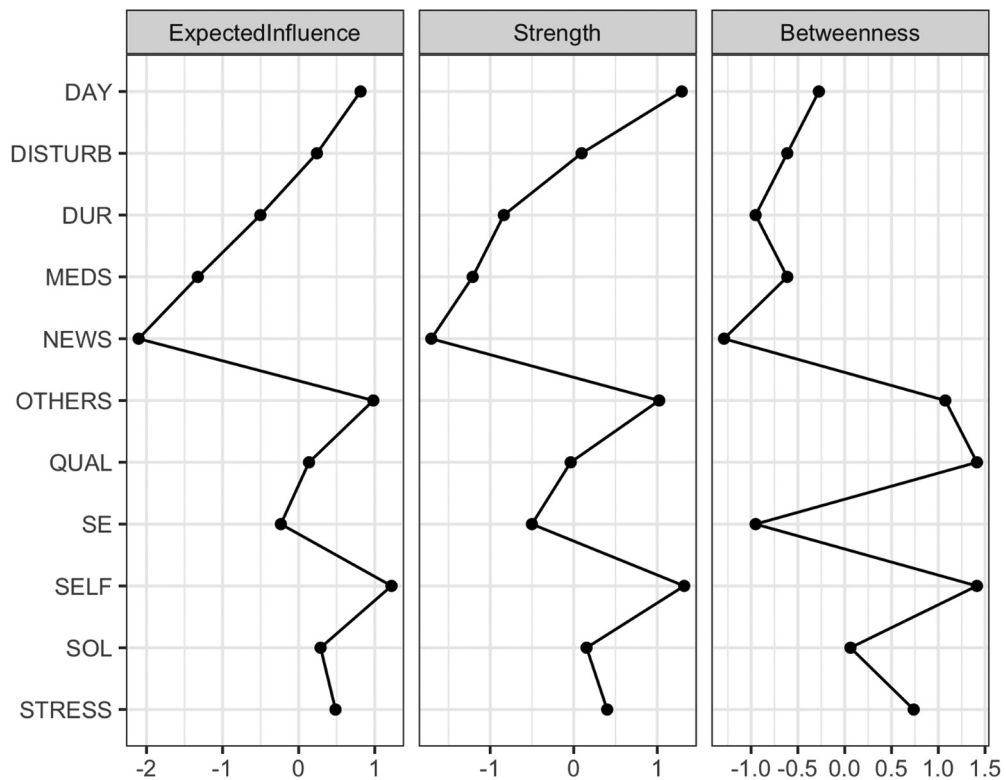
**Partial Regularized Correlation Network**

As hypothesized, [Figure 1](#) illustrates that COVID-19 news consumption was positively associated with psychological stress related to COVID-19 ( $r_p = .14$ ) and worry about family and friends getting COVID-19 ( $r_p = .21$ ). However, we observed several patterns that were contrary to our hypotheses. For example, consuming

more COVID-19 news was not associated with greater worry about becoming sick with COVID-19 ( $r_p < .01$ ). Furthermore, consuming more COVID-19 news consumption showed no relationship with any sleep outcome measures ( $r_{ps} < .02$  for all sleep outcomes).

### Network Centrality Metrics

Network centrality metrics are depicted in Figure 2. COVID-19 news consumption had the lowest expected influence and strength of all variables. This means that the summed correlation weights for each node connected to news consumption were low, or that it had weak ties overall with the rest of the nodes in the network. News consumption also had the lowest betweenness in the network, suggesting that other nodes did not frequently need to pass through this variable to connect with each other.



**Figure 2.** Expected influence, strength, and betweenness for each node in the full sample ( $N = 586$ ). Note. Plots depict z-scored values for each node. NEWS = COVID-19 news consumption; STRESS = COVID-19 related psychological stress; OTHERS = worry about others getting COVID-19; SELF = worry about oneself getting COVID-10; QUAL = subjective sleep quality; SOL = sleep latency; DUR = sleep duration; SE = habitual sleep efficiency; DIST = sleep disturbances; MEDS = use of sleeping medication; DAY = daytime dysfunction.



**Table 3.** Associations between gender and key study variables.

| Dependent Variable Name               | $\beta$ (SE)     | 95% C.I.            | OR          | <i>p</i>         |
|---------------------------------------|------------------|---------------------|-------------|------------------|
| COVID-19 news consumption             | <b>.33 (.15)</b> | <b>[1.04, 1.88]</b> | <b>1.40</b> | <b>.028</b>      |
| COVID-19-related psychological stress | <b>.55 (.15)</b> | <b>[1.29, 2.31]</b> | <b>1.72</b> | <b>&lt; .001</b> |
| Worry about others getting COVID-19   | <b>.57 (.15)</b> | <b>[1.31, 2.36]</b> | <b>1.76</b> | <b>&lt; .001</b> |
| Worry about oneself getting COVID-19  | <b>.35 (.15)</b> | <b>[1.06, 1.90]</b> | <b>1.42</b> | <b>.017</b>      |
| Subjective sleep quality (PSQI-1)     | <b>.33 (.15)</b> | <b>[1.22, 2.34]</b> | <b>1.69</b> | <b>.001</b>      |
| Sleep onset latency (PSQI-2)          | -.02 (.15)       | [0.72, 1.31]        | 0.97        | .858             |
| Sleep duration (PSQI-3)               | .09 (.16)        | [0.80, 1.50]        | 1.09        | .575             |
| Habitual sleep efficiency (PSQI-4)    | .27 (.18)        | [0.92, 1.89]        | 1.32        | .136             |
| Sleep disturbances (PSQI-5)           | .13 (.16)        | [0.83, 1.56]        | 1.13        | .438             |
| Use of sleeping medication (PSQI-6)   | <b>.36 (.17)</b> | <b>[1.03, 2.02]</b> | <b>1.44</b> | <b>.035</b>      |
| Daytime dysfunction (PSQI-7)          | .10 (.06)        | [0.81, 1.49]        | 1.10        | .540             |

Note. Reference group = male.

SE = Standard Error; 95% CI = 95% Confidence Interval; OR = Odds Ratio.

Results are bolded when  $p < .05$ .

### Gender Differences

A series of cumulative link regression models revealed significant gender differences (Table 3). Specifically, women reported worse subjective sleep quality, more frequent use of sleep medications, greater COVID-19 news consumption, greater worries about oneself getting COVID-19, greater worries about others getting COVID-19, and greater psychological stress related to COVID-19. Males and females were similar on other outcomes (Table 3).

We examined whether any moderation effects were present by explicitly testing interactions between gender and study variables within a single network using the mgm package in R (Haslbeck & Waldorp, 2020; note that gender-separated networks, centrality metrics, and stability estimates are provided in the online supplement). By resampling the network using 1,000 bootstraps, we concluded that gender did not moderate any of the relationships in the network, contrary to our hypotheses (Figure 3).

### Discussion

Using a network analytic approach, we demonstrated that COVID-19 news consumption was associated with psychological stress related to COVID-19 as well as worry about family and friends getting COVID-19 (but not oneself getting COVID-19). These findings support prior work that media exposure to a global catastrophe is linked with psychological stress (Houston et al., 2018; Lachlan et al., 2009), and highlight worries about loved ones (but not oneself) as a specific correlate of COVID-19 news consumption.

Interestingly, in contrast to contemporary theoretical viewpoints, the hypothesized associations between news consumption and sleep quality in the beginning of the pandemic were not supported. Our data were collected in the early stages of lockdown, before the relationship between COVID-19 impact and sleep health was well understood. For instance, a recent meta-analysis showed that COVID-19 patients experience more sleep problems than both the general population and health care workers (Jahrami et al., 2021). Only 3.6% of our sample reported having tested positive for COVID-19 at the time of study participation, suggesting that having directly experienced COVID-19 would not yet have influenced most of our participants' sleep. We also did not assess moderators of



Moreover, while considerable research provides evidence for the pandemic's negative impacts on sleep (e.g., Alimoradi et al., 2021), other research suggests that peoples' sleep did not change (Kocevska et al., 2020), or in some cases even improved (Beck et al., 2021b; Gao & Scullin, 2020), over the early months of the pandemic. COVID-19 is different from other crises like terrorist attacks or natural disasters, which are highly stressful but do not always usher in an overhaul of daily routines. During lockdown, many people no longer needed to wake up early to commute for work (Staller & Randler, 2021), which may have improved some sleep outcomes in some participants, even if they were distressed by watching the news late at night. Additionally, it is possible that the stress caused by watching news can in some ways be canceled out by the more positive aspects of news-watching, such as increased access to health guidelines (Scopelliti et al., 2021).

Gender also did not moderate any associations, despite women endorsing greater COVID-19-related worries and news consumption. One potential explanation is that males and females experienced similar levels of information overload from news consumption before (Schmitt et al., 2018) and during the pandemic (Hong & Kim, 2020). Research has also shown that men experienced several significant stressors early in the pandemic that have been thought to primarily affect women in the past (e.g., caregiving burden; Russell et al., 2020). Thus, men are likely still susceptible to the psychological impacts of COVID-19, despite being less worried and stressed overall.

Finally, with respect to the network centrality metrics, COVID-19 news consumption was not a particularly important or 'well-connected' node in the network. This likely reflects the low overall correlation between COVID-19 news consumption and the PSQI sleep variables in the network. There may have also been a ceiling effect for the COVID-19 news variable, given that most participants either moderately or strongly agreed that they read a lot of news about COVID.

## Strengths and Limitations

Strengths of the current study included the use of network analysis, which enabled us to reduce spurious associations among study variables via statistical regularization, thereby increasing confidence in our results. Moreover, rather than examining participants' general level of stress and/or worry, we studied the stress and worry specifically related to the pandemic and disentangled worries about oneself getting COVID-19 with worries about one's loved ones getting COVID-19.

The study findings should also be interpreted within the context of its design. We relied on a single-item measure of COVID-related psychological stress. The sample was also primarily White, and results may not generalize as well to individuals from racial/ethnic minority backgrounds. Additionally, causality cannot be determined, due to the cross-sectional nature of the study. However, a recent study found that more exposure to COVID-19 news was associated with greater same-day and next-day pandemic worries (Kellerman et al., 2022), suggesting that news exposure does tend to precede stress. Additional longitudinal and experimental research examining individual news consumption trajectories is warranted to disentangle the causal effects of news consumption on stress and sleep quality. Finally, our COVID-19 news variable only reflected whether individuals had read news related to COVID-19. Given how much COVID-19-related

news consumption occurs online (e.g., on social media; Van Aelst et al., 2021), reading about COVID-19 is likely a good proxy of total news consumption, but future research should incorporate other specific modalities as well (e.g., watching television).

## Implications and Conclusions

This study affirmed that news consumption related to COVID-19 is associated with COVID-19-related psychological stress and worries about friends and family contracting COVID-19. However, poor sleep quality was not linked with pandemic-related stress, worries, and news consumption. This may reflect that for some individuals, sleep may have been unaffected, or possibly even improved, during the early pandemic (e.g., Staller & Randler, 2021). Public health initiatives and/or clinical interventions focused on reducing excessive news consumption may be helpful in reducing stress (Anand et al., 2022), before stress begins to have negative downstream effects on sleep quality and other aspects of health (Cox & Olatunji, 2021). Overall, this study contributes to a growing body of research underscoring the potentially harmful psychological effects of (too much) news consumption in the context of a global pandemic.

## Notes

1. While other studies have used network analysis to examine the association between sleep problems and anxiety during the pandemic (e.g., Cai et al., 2022; Tao et al., 2022), none to our knowledge have analyzed pandemic-related news consumption.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## Ethics approval

The study was approved by the Institutional Review Board at Baylor University.

## Consent to participate

Informed consent was obtained from all individual participants included in the study.

## Availability of data and material

Data analyzed for the study are available at the Open Science Framework: <https://osf.io/ey3fz/>

## Code availability

Code used to analyze data is available at the Open Science Framework: <https://osf.io/qgtxy/>

## Authors' contributions

**Ilana Ladis:** Conceptualization, Formal Analysis, Writing – Original Draft, Writing – Review & Editing, Visualization. **Chenlu Gao:** Methodology, Investigation, Data Curation, Writing – Review & Editing, Supervision. **Michael K. Scullin:** Methodology, Writing – Review & Editing, Supervision.

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