

Stress and Sleep Disturbances During a COVID-19 Lockdown

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Abstract

A COVID-19 related Stress Scale was developed for this study to address the specific stressors related to the pandemic lockdown experience. Based on a Survey Monkey study on 260 healthy individuals (18-82 years), the stress scale scores and its individual items were significantly correlated with scores on scales for health, media use, mood states including anxiety and depression, posttraumatic stress symptoms, fatigue and sleep disturbances. Stepwise regression analysis suggested that depression, media use and fatigue scale scores contributed to 52% of the variance on the stress scale scores. In turn, the stress scale scores and items were significantly correlated with sleep disturbances, as were health, anxiety, depression, fatigue and PTSD symptoms. Stepwise regression analysis revealed that 52% of the variance on the sleep scale scores was explained by fatigue and posttraumatic stress scale scores. These data suggest that individuals experiencing COVID-19 lockdowns are experiencing psychological symptoms and lockdown-related stressors that are contributing to sleep disturbances that highlight the need for interventions during lockdowns.

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Key words: COVID-19; depression; fatigue; media; PTSD; sleep disturbance; stress

Introduction

Several negative effects have been noted for the psychological well-being of individuals experiencing COVID-19 lockdowns including anxiety, stress, and depression. In a COVID-19 study from Italy, for example, higher stress scores were related to greater depression and anxiety scale scores [1]. These effects, based on standardized measures, have been reported for many stressful experiences and natural disasters, as for example, hurricane Andrew [2]. Stress has also been associated with sleep disturbances during COVID-19. For example, in an Australian sample, sleep quality was compromised in 41% of the sample [3]. and, in a survey from the China COVID pandemic, sleep problems were related to PTSD [4]. In these studies, however, the stressors that specifically relate to the lockdowns have not been identified.

Identifying the stressors that may be unique to a lockdown during a pandemic like COVID-19 might help inform prevention/intervention protocols for coping with such an experience. For that reason, a COVID-19 related Stress Scale was created for the current study with items descriptive of stressors that were anecdotally being experienced during the early stage of the COVID-19 lockdown. These included worrying about the virus, worrying about financial status, feeling isolated, lonely, bored, and touch deprived as well as having “cabin fever” and engaging in excessive snacking, drinking alcohol and napping. These were then included in the Stress Scale for the survey reviewed in this paper.

The purposes of the data analyses for this paper were to determine: 1) the degree to which the scores of the newly designed COVID-19 lockdown- related Stress Scale scores related to other scale scores on

health, media use, mood states including anxiety and depression, PTSD symptoms, fatigue and sleep disturbances and the relative variance that these problems contributed to the Stress Scale scores.; and 2) the degree to which sleep disturbance scores were, in turn, related to stress and psychological problems as well as the variance that they contributed to the sleep disturbances scale scores. The scores of the newly designed Stress Scale based on lockdown-related stressors were expected to be related to the more standardized scale scores for psychological symptoms and sleep disturbances. And, psychological symptoms were expected to contribute to significant amounts of the variance on the stress scale and on the sleep disturbance scale.

Methods

This survey was a cross-sectional study on a convenience sample recruited via social media following approval by the university Institutional Review Board.

Participants

A G* power analysis indicated that a sample size of 224 was required for an alpha of .05 and 80% power. The participants included healthy individuals (N=260) who ranged in age from 18-82 (M=47 years). Gender was distributed 79% female, 18% male and 3% other (not identified). Ethnicity was distributed 68% Non-Hispanic White, 21% Hispanic, 3% Black and 8% other (not identified). Professions were distributed 35% office worker, 30% academic, 15% managerial, 12% medical and 8% labor. The average income was \$72,572, and 28% were unemployed and 69% worked at home. Twenty-three per cent lived alone.

Procedure

A flyer was posted on Facebook giving a brief description of the study including some sample items and the age criterion being greater than 18 years. The Facebook flyer included a link to the survey on Survey Monkey which included 11 scales for a total of 87 items. The survey was four weeks duration (April 1-30, 2020), and the data were directly transported to SPSS for data analyses.

Measures

The survey included a demographic scale including several items already mentioned (age, gender, ethnicity, profession, income, type of employment, working at home and living alone). The following five scales were created specifically for this survey to relate to activities and stress associated with the COVID-19 lockdown. The participants rated the items on the scales from zero meaning “not at all” to three meaning “a lot” including:

1) The **Health Scale** (15 items) (Cronbach’s alpha=.66) which included exercise (inside exercise, outside exercise and outside exercise with others and the types of exercise), touching (touching partner, kids and self and the types of touching), COVID- 19-related safety practices (including washing hands and social distancing), self-care, spiritual activities (meditating and feeling spiritual) and liking being at home. A factor analysis yielded three factors contributing to 47 % of the variance on the Health Scale score: Factor 1 Self/Spiritual Care- Meditating (.74), Self-Care (.68), and Feeling Spiritual (.77)- 23 % of the variance; Factor 2 Touching- Touching your kids (.75) and Touching your partner or friend (.72)- 14% of the variance; Factor 3 Exercise- Outside exercise (-.89) and Exercise outside with someone else (-.76)- 10% of the variance.

2) The **Media/Communication Scale** (10 items) (Cronbach’s alpha=.58) including talking on the phone, texting, on the Internet, gaming, on Facebook/Instagram, spending time receiving and sending messages/media about the virus, engaging in Zoom/Skype/Facetime activities (e.g. Yoga, meditation), watching the news, watching other TV programs and watching movies. A factor analysis yielded four factors contributing to 61 % of the variance on the Media/Communications Scale score: Factor 1 Entertainment-Watching movies (.84), TV programs (.80)- 23 % of the variance; Factor 2 Communication- phone (.80), texting (.70), Zoom (.63)-14% of the variance; Factor 3 Social Media- on internet (.78), Facebook (.60)-13% of the variance; and Factor 4-COVID News-watching the news (.79) and messaging about the virus (.60)- 11% of the variance; ;

3) The **Connecting Scale** (4 items) (Cronbach’s alpha =.41) which included connecting with friends, trying to connect with old friends, helping children do homework and receiving support from others;

4) The **Working Scale** (6 items) (Cronbach’s alpha=.61) including cooking, caregiving, housekeeping, paperwork, creative work and working on projects/hobbies; and

5) The **Stress Scale** (11 items) (Cronbach’s alpha =.78) which included worrying about getting a virus, worrying about your financial status, wanting this experience to end, feeling isolated, feeling lonely, feeling bored, feeling touch deprived, snacking, drinking alcohol, napping, and getting “cabin fever”.

The standardized scales on the survey included 4 PROMIS Subscales [5] (each item was rated on a 5-point scale as 1= never, 2= rarely, 3= sometimes, 4= often and 5=always) which included : 1) the **PROMIS Anxiety Subscale** (4 items) (Cronbach’s alpha=.88) which included I felt fearful, I found it hard to focus on anything other than my anxiety, my worries overwhelmed me and I felt uneasy; 2)the **PROMIS Depression Subscale** (4 items) (Cronbach’s alpha =.91) including I felt worthless,

helpless, depressed and hopeless; 3) the **PROMIS Fatigue Subscale** (3 items) (Cronbach’s alpha=.92) including I felt fatigued, I had trouble starting things because I’m tired and I felt run-down; and 4) the **PROMIS Sleep Disturbance Subscale** (4 items) (Cronbach’s alpha =.86) which included my sleep quality was bad, my sleep is not refreshing, I had a problem with my sleep and I had difficulty falling asleep.

The second standardized scale was a PTSD Screener entitled “**PTSD-8: A short PTSD Inventory**” (8 items) (Cronbach’s alpha=.92) [6]. This inventory is introduced by the statement “If you’re being reminded of a traumatic experience, please rate how much the following have bothered you during the lockdown” as: 0) not at all, 1) rarely, 2) sometimes and 3) most of the time. The items are: recurrent thoughts and memories of the event, feeling as though the event is happening again, recurrent nightmares about the event, sudden emotional or physical reactions when reminded of the event, avoiding activities that remind you of the event, avoiding thoughts or feelings associated with the event, feeling jumpy/easily startled and feeling on guard.

Data Analyses

The data analyses included the following: 1) Correlation analyses to determine relationships between the stress scale and its items and between the other scales and their items; 2) Factor analysis to determine the factors and their loadings on the Stress Scale. 3)ANOVAS based on comparisons of high and low stress groups (determined by a median split on the Stress Scale scores) ; 3)stepwise regressions to determine the relative variance in the Stress Scale scores that could be explained by the scores on the psychological scale and sleep disturbance scale scores. The same analyses (correlation analyses, ANOVAs and stepwise regressions) were conducted on the Sleep Disturbance Scale scores.

Results

Correlation Analyses Yielding Significant Coefficients for COVID-19 Related Stress Scale Scores

The Survey Monkey data were first submitted to correlation analyses for those scales and items related to the COVID-19 related Stress Scale scores. Those analyses revealed a number of significant correlation coefficients (at the $p < .05$ level and almost all at $p = .0001$ level) for the stress scale scores including more often “**living alone**” and the following (see **Table 1 for the correlation coefficients for the stress scale scores**):1) a negative coefficient for the **Health Scale** total score and the items including less touching partner, less liking being home, less self-care and feeling less spiritual; 2) positive coefficients on the **Media/Communication scale** total score and its items including more stress related to being on the internet, Facebook, messaging regarding the virus and more time on zoom ; 3) positive coefficients for all of the **Stress Scale** items including greater worrying about the virus, about finances, wanting this experience to end, feeling isolated, lonely, bored and touch deprived and greater alcohol, napping and cabin fever; 4)for the **PROMIS Anxiety Subscale** total score and all its items (feeling fearful, focus on anxiety, overwhelming worries and feeling uneasy); 5) for the total score on the **PROMIS Depression Subscale** and all its items including feeling worthless, helpless, depressed and hopeless; 6) for the total score on the **PROMIS Fatigue Subscale** and all its items including fatigue, tired and run-down; 7) for the total score on the **PROMIS Sleep Disturbance Subscale** and all its items including quality of sleep, refreshing sleep, problems with sleep, and falling asleep; and 9) for the total score on the **PTSD Inventory** and all its items including recurrent thoughts or memories, feeling the event is happening again, recurrent nightmares, sudden emotional and physical reactions, avoiding activities that remind you of the event as well as thoughts and feelings associated with the event, feeling jumpy/easily startled and feeling on guard.

Measure	Correlation coefficient	p level
Health scale score	-0.25	0.0001
Media communications scale score	0.24	0.0001
Promis anxiety subscale score	0.61	0.0001
Promis depression subscale score	0.61	0.0001
Promis fatigue subscale score	0.49	0.0001
Promis sleep disturbance subscale score	0.43	0.0001
Posttraumatic stress inventory score	0.42	0.0001

Table 1. Correlation coefficients for significant relationships between COVID-19 Stress Scale Scores and other scores on Survey scales and subscales.

Factor Analysis of the COVID-19 Related Stress Scale

A factor analysis was conducted on the COVID-19 related Stress Scale that had been created for this survey to include items that specifically pertained to the pandemic. The factor analysis yielded three significant components that could be called: 1)feelings of deprivation, with heavy loadings on feeling isolated, lonely, bored, touch deprived and cabin fever; 2)COVID-related worries “about getting the virus” and “about your financial status”; and 3) stress behaviors-snacking/napping. These components contributed to 56% of the variance on the COVID-19 Related Stress Scale scores. Both Component Analysis and Pattern Analysis yielded the same three components.

Analyses of Variance (ANOVAs) on High and Low Stress Groups Based on a Median Split

High stress and low stress groups were formed by a median split on the COVID related Stress Scale scores. Group comparisons by ANOVAs yielded virtually the same effects as were noted for the correlation analyses (see Table 2 for the ANOVAs for the stress scale group scores). The only exceptions were that some of the significant correlations were not replicated in the ANOVAs on the group comparisons. These exceptions included that: 1) the only significant health scale item that significantly differentiated the groups was self-care; and 2) the Zooming item did not differentiate the groups. Other than those exceptions, all the items differentiated the high stress from the low stress groups at the $p < .05$ level, and almost all of the group differences were significant at the $p = .0001$ level. The MANOVA for this analysis was significant (Wilks’ Lambda $F = 10.51, p = .0001, \eta^2 = .40$).

Measure level	Low Stress	High Stress	F value	p	eta ²
Health	32.74(4.75)	30.52 (6.12)	9.27	0.003	0.28
Media	26.26(4.44)	27.63 (3.82)	6.55	0.01	0.16
Anxiety	8.23(3.01)	11.94 (3.17)	90.22	0.0001	0.51
Depression	6.43(2.67)	10.83 (3-.94)	112.24	0.0001	0.55
Fatigue	6.99(2.69)	09.51 (3.04)	48.85	0.0001	0.40
Sleep Disturbance	12.49(4.24)	15.60 (4.34)	32.61	0.0001	0.34
PTSD-8	12.47(5.30)	16.95 (5.60)	30.16	0.0001	0.38

Table 2. Mean scale scores for significant ANOVAs for high versus low stress groups (standard deviations in parentheses).

Stepwise Regression Analysis on the COVID-19 Stress Scale Scores

Those scales that were significantly correlated with the COVID-19 Stress Scale (see Table 1 for those correlations) were entered into a

stepwise regression analysis including the Health Scale, the Media/Communication Scale, the PROMIS Anxiety Scale, the PROMIS Depression Scale, the PROMIS Fatigue Scale, the PROMIS Sleep Scale and the PTSD Inventory. The Stepwise Regression entered three scales that made significant contributions to the variance including the PROMIS Depression Scale that contributed 45%, the Media Scale that added 4% and the PROMIS Fatigue scale that added 3% for a total of 52% of the variance in the COVID-19 Stress Scale (see Table 3).

Model	R	R ²	F value	p level
Promis depression	0.67	0.45	124.56	0.0001
Media/communication	0.70	0.49	73.48	0.0001
Promis Fatigue	0.72	0.52	54.04	0.0001

Table 3. Stepwise regressions for COVID-9 Related Stress Scale

Correlation Analyses Yielding Significant Coefficients for the PROMIS Sleep Disturbance Sub-Scale Scores

The Survey Monkey data were submitted to correlation analyses to determine those scales and items that were significantly correlated with the PROMIS Sleep Disturbance Subscale Scores. Those analyses revealed a number of significant correlation coefficients (at least at the $p < .05$ level and most at the $p = .0001$ level) for the sleep scale scores including “being a younger age” and the following (see Table 4 for the correlation coefficients for the Sleep Disturbance scale scores):1) a negative coefficient for the Health Scale total score and the items including less indoor exercise, less outdoor exercise, less self-touch, less meditating, less liking being home and less self-care and feeling less spiritual; 2) more Facebook time; 3) a positive coefficient for the Stress Scale total score and all its items except the alcohol item and including greater worrying about the virus, about finances, wanting this experience to end, feeling isolated, lonely, bored and touch deprived and greater snacking, napping and cabin fever; 4)for the PROMIS Anxiety Subscale total score and all its items (feeling fearful, focus on anxiety, overwhelming worries and feeling uneasy); 5) for the total score on the PROMIS Depression Subscale and all its items (feeling worthless, helpless, depressed and hopeless); 6) for the total score on the PROMIS Fatigue Subscale and all its items (fatigue, tired and run-down); 7) for the total score on the PROMIS Sleep Disturbance Subscale and all its items (quality of sleep, refreshing sleep, problems with sleep, and falling asleep); and 9) for the total score on the PTSD Inventory and all its items (recurrent thoughts or memories, feeling the event is happening again, recurrent nightmares, sudden emotional and physical reactions, avoiding activities that remind you of the event as well thoughts and feelings associated with the event, feeling jumpy/easily startled and feeling on guard).

Measure	Correlation coefficient	p level
Health scale score	-0.29	0.0001
Covid-19 related stress scale score	0.43	0.0001
Promis anxiety subscale score	0.55	0.0001
Promis depression subscale score	0.53	0.0001
Promis fatigue subscale score	0.63	0.0001
Posttraumatic stress inventory score	0.59	0.0001

Table 4. Correlation coefficients for significant relationships between PROMIS Sleep Disturbance Sub-Scale Scores and other scores on the Survey scales and subscales.

Analyses of Variance (ANOVAs) on High and Low Sleep Disturbance Scores Based on a Median Split

High and low sleep disturbance groups were formed by a median split on the PROMIS Sleep Disturbance Subscale scores. Group comparisons by ANOVAs yielded similar effects as were noted for the

correlation analyses (see Table 5 for the ANOVAs for the high and low sleep disturbance groups). The only exceptions were that some of the significant correlations were not replicated in the ANOVAs on the group comparisons. These exceptions included: 1) the only significant Health Scale items were touching the partner, meditating, liking being at home, self-care and feeling spiritual; 2) the only Media/Communication Scale item that differentiated the groups was gaming; 3) all the Stress Scale items except drinking and napping differentiated the groups. Other than those exceptions, all the items differentiated the high sleep disturbance from the low sleep disturbance groups at the $p < .05$ level, and almost all of the group differences were significant at the $p = .0001$ level. The MANOVA for this analysis was significant (Wilks' Lambda $F = 9.78$, $p = .0001$, $\eta^2 = .39$).

Measure level	Low	High	F value	p	eta2
Health	33.02 (5.38)	30.08 (5.23)	16.49	0.0001	0.27
Stress	25.20 (5.77)	29.91 (6.03)	39.49	0.0001	0.37
Anxiety	8.48 (3.01)	11.82 (3.28)	68.39	0.0001	0.46
Depression	6.92 (3.10)	10.42 (4.04)	60.89	0.0001	0.44
Fatigue	6.71 (2.69)	10.00 (2.60)	95.59	0.0001	0.52
PTSD-8	11.47 (4.23)	17.87 (5.57)	76.03	0.0001	0.55

Table 5. Mean scale scores for significant ANOVAs for high versus low sleep disturbance groups (standard deviations in parentheses).

Stepwise Regression Analysis on the PROMIS Sleep Disturbance Subscale Scores

Those scales that were significantly correlated with the PROMIS Sleep Disturbance Scale scores (see Table 4 for those correlations) were entered into a stepwise regression analysis including the Health Scale, the Media/Communication Scale, the Stress Scale, the PROMIS Anxiety Scale, the PROMIS Depression Scale, the PROMIS Fatigue Scale and the PTSD Inventory. The Stepwise Regression entered two scales that made significant contributions to the variance including the PROMIS Fatigue Subscale scores that contributed to 40% of the variance in the PROMIS Sleep Disturbance Subscale scores and PTSD Inventory scores that added 12% to the variance for a total of 52% of the variance on the PROMIS Sleep Disturbance Subscale scores (see Table 6).

Model	R	R ²	F value	p level
Promis Fatigue Subscale Score	0.64	0.40	107.48	0.0001
PTSD-8	0.73	0.52	87.17	0.0001

Table 6. Stepwise regressions for Sleep Disturbances Scale.

Discussion

Depression, media and fatigue scores contributed to 52% of the variance, with depression explaining 45% of the variance on the Stress Scale that was created for this lockdown survey. The association between stress and depression had already been noted in a nationwide survey of Italian people during the COVID-19 pandemic [1]. A similar association was reported in Australia during the COVID-19 pandemic [3]. In still another pandemic survey, 24% of the sample were experiencing moderate to severe depression and 50% reported moderate to severe stress levels [7]. In the latter sample, 52% also reported sleep disturbances. The association between stress and sleep has been noted in still another study that also implicated excessive use of media [8]. That excessive use of media would contribute to stress is difficult to interpret, although it only added a small amount of the variance (4%). Similarly, the fatigue scale

scores contributed to a small amount (3%) of the variance in the stress scores.

In contrast, fatigue explained most of the variance noted in the regression analysis on sleep disturbances (40% of the variance). Napping to reduce fatigue might have mediated the fatigue/sleep relationship, and the napping variable was significantly positively correlated with the sleep disturbance scale scores. However, fatigue and napping were only weakly related ($r = .13$, $p < .05$), and the napping rating on the stress scale did not differentiate the high and low sleep disturbance groups in the analysis of variance. That the PTSD-8 inventory score added significant variance (12%) in the regression on sleep was not surprising as sleep problems have been related to PTSD in at least two previous studies. For example, in the earlier SARS epidemic, 40% of SARS survivors experienced posttraumatic stress syndrome and 58% had sleep problems [9]. In the more recent COVID-19 sample from China, sleep disturbances were associated with posttraumatic stress syndrome [4]. This association has been reported in other studies. For example, in an Australian Facebook study using the PROMIS scales used in the current study, PTSD was the most significant contributor to sleep problems, but inclusion of fatigue in that model attenuated that effect [10]. In the same sample, 15% experienced sleep problems, 12% experienced fatigue and 7% reported a combination of sleep problems and fatigue. Although sleep problems have often been noted to contribute to fatigue, the literature has been limited on the contribution of fatigue to sleep problems.

Surprisingly, the stress scale scores did not contribute to the variance in the sleep disturbances scale as might be expected even though stress and sleep disturbance scores were significantly correlated ($r = .43$, $p = .0001$). However, the variables that contributed to the variance on the sleep scale scores had higher correlation coefficients. For examples, the correlation between fatigue and sleep disturbances was higher ($r = .63$, $p = .0001$) as was the correlation between PTSD and sleep disturbances ($r = .59$, $p = .0001$). More sophisticated analyses such as mediation/moderation analysis or structural equation models might be used in future studies to understand the interrelationships between these variables. For example, a significant path has been suggested by the correlation analyses between depression and stress ($r = .61$) which, in turn, may contribute to fatigue ($r = .49$), and fatigue, in turn, was highly correlated with sleep problems ($r = .63$) (all correlations at the $p = .0001$).

In addition, further research is needed on underlying mechanisms for both stress and sleep disturbances. Not surprisingly, living alone was related to higher stress scores but surprisingly, being younger was correlated with higher sleep disturbance scores. In a different set of analyses on these COVID-19 data, the younger/living alone group had the most problematic scores on all the variables [11]. These demographic variables may help identify those needing intervention during pandemics like COVID-19. Other potential underlying mechanisms for stress and sleep disturbances in this Survey Monkey Sample may be touch deprivation and the lack of exercise. In another analysis of this dataset, touch deprivation was correlated with both stress and sleep disturbances and with the primary predictor variables for stress and sleep disturbances in the current regression analyses, namely depression and fatigue respectively [12]. And, touch has been noted to decrease these problems [13]. Exercise was also inversely related to these problems in an earlier analysis of these COVID-19 data [12]. And, other studies have suggested that exercise can improve sleep [14] and reduce depression [15]. Together those data analyses suggest that touch and exercise may be effective therapies for stress and sleep problems during Pandemics like COVID-19. Others have also recommended physical exercise along with cognitive interventions and relaxation techniques [16]. Surprisingly, the COVID-19 literature so far has not included intervention studies

The current study has a number of methodological limitations including that the data are based on a sample of predominantly non-

Hispanic white females. Although this ethnic and gender distribution is reputedly representative of Survey Monkey samples, the data would not be generalizable to the larger population. In addition, they are self-report data, although their anonymity may contribute to their veridicality. And, the directionality of effects cannot be determined from cross-sectional data. The selection of outcome variables is arbitrary, for example, treating stress as an outcome variable in the regression analysis with the depression variable explaining most of its variance. Stress scale scores may as likely contribute significant variance to depression scale scores. And sleep and fatigue are also likely to be bi-directional or have reciprocal effects. Nonetheless, the prevalence data and the regression analyses are suggestive that stress and depression and sleep and fatigue are significant COVID-19 lockdown problems that highlight the need for prevention/intervention protocols.

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