The Indirect Effects of Disordered Social Media Use on Stress and Depression via Fear of
COVID-19

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Abstract

The 2019 novel coronavirus disease (COVID-19) is a global threat that has negative impacts on individuals' physical and mental health. During the COVID-19 pandemic, use of social media increased exponentially in response to face-to-face social restrictions and distancing. The stress of COVID-19, combined with this increase, may have resulted in disordered social media use, which could further impact psychological wellbeing. Here, we investigated if disordered social media use predicts psychological wellbeing (as measured by stress and depression symptoms) and if this predictive has indirect effects via the fear of COVID-19. In addition, we also explored several risk and protective factors for the stress and depression related to the fear of COVID-19, including age, gender, resilience, and social connectedness. Participants (50.57 male; $M_{age} = 39.15$, $SD_{age} = 13.49$) were recruited via social media advertisements and completed an online, anonymous questionnaire measuring disordered social media use, fear of COVID-19, perceived stress, and depression symptomatology. Results indicated that disordered social media use predicts stress indirectly through fear of COVID-19. Further, disordered social media use directly predicted depression, and there was also an indirect effect via fear of COVID-19. Regarding risk and protective factors, we found that the relationship between fear of COVID-19 and stress is stronger for older people than younger people. Given the direct and indirect relationships between disordered social media use and psychological wellbeing, it is possible that psychological wellbeing may be negatively impacted by social media content that promotes an individual's fear of COVID-19.

Keywords: COVID-19, Social Media, Depression, Stress

The 2019 novel coronavirus disease (COVID-19) is a global threat that has negative impacts on individuals' physical and mental health (Bhuiyan, et al., 2020). Researchers worldwide are generating evidence for the need for interventions that effectively manage the physical, psychological, and emotional impact of COVID-19. Two recent studies from China reported high levels of psychological distress during the initial stages of the pandemic (Qiu, et al., 2020a; Qiu, et al., 2020b). In Australia, depression and stress scores during the pandemic are slightly elevated compared to normative data for Australian adults (Stanton et al. 2020). Moreover, in Italy, depression, anxiety and stress scores were higher than the Australian sample (Mazza et al. 2020). We also know that around 86% of people are in COVID-19 related stress in Bangladesh (Islam et al., 2020). Overall, there is a general trend internationally of decreased psychological well-being during COVID-19.

Social Media and Psychological Wellbeing

As a result of social restrictions and distancing regulations as a method of controlling the spread of COVID-19, social media use during COVID-19 has increased exponentially (Wiederhold, 2020). In Australia, there has been up to a 33% increase in social media use during the pandemic (We Are Social, 2020). Of concern is that this increased social media use may impact psychological wellbeing. Social media fatigue, defined as mental exhaustion because of overexposure to social media (Bright et al, 2015) has been associated with increased anxiety and depression (Dhir et al. 2018). During the COVID-19 pandemic, researchers have shown that social media exposure has impacted psychological well-being and behaviour. For example, the prevalence of mental health problems is related to the frequency of social media exposure during COVID-19 (Gao et al. 2020).

Social Media Disorder draws the line between healthy and unhealthy social media use. The disorder is broken up into 9 dimensions. For example, the Social Media Disorder Scale (Van Den Eijnden, Lemmens, & Valkenburg, 2016) taps into each of these dimensions with items that complete the following sentence stem: “During the past year, have you...” Phrases that represent each dimension of Social Media Disorder are used to complete the stem. For Preoccupation, an example item is “... regularly found that you can't think of anything else but the moment that you will be able to use social media again?” For Tolerance, an example item is “... regularly felt dissatisfied because you wanted to spend more time on social media?” For Withdrawal, an example item is “... often felt bad when you could not use social media?” For Persistence, an example item is “... tried to spend less time on social media, but failed?” For Escape, an example item is “... often used social media to escape from negative feelings?” For Problems, an example item is “... regularly had arguments with others because of your social media use?” For Deception, an example item is “... regularly lied to your parents or friends about the amount of time you spend on social media?” For Displacement, an example item is “... regularly neglected other activities (e.g. hobbies, sport) because you wanted to use social media?” For Conflict, an example item is “... had serious conflict with your parent(s) and sibling(s) because of your social media use?”

In the current study, we employ the stressor-strain-outcome model (SSO; Koeske & Koeske, 1993) to explore the relationship between disordered social media use and psychological outcomes during COVID-19. The SSO has been employed to explore social media use and outcomes (Cao et al., 2018; Lee et al., 2016) and is an appropriate model for the current study because the model emphasises stressors (i.e., increased social media use), strains (i.e., emotional stressors; fear of COVID-19), and outcomes (i.e., impact on wellbeing; Figure 1). We note that

fear of COVID-19 may be a particularly important strain, given reports that reading or hearing about the severity and contagiousness of COVID-19 was stress inducing (Park et al., 2020).

Risk and Protective Factors

The SSO model predicts that fear of COVID-19 will have a negative association with psychological wellbeing. Given these predictions it is important to explore several risk and protective factors related to fear of COVID-19 and psychological well-being. For example, loneliness and social isolation are associated with poor mental and physical health and may increase the likelihood of common mental disorders (e.g., depression and anxiety disorders), substance use, and cognitive decline (Courtin & Knapp, 2017). During COVID-19, there has been a global requirement for individuals to self-isolate and limit social interaction, and this isolation has been associated with elevated levels of anxiety and depression in the USA, UK, and Brazil (van Mulukom et al., 2017). During these difficult times researchers have noted that hope and resilience had direct positive effects on psychological health (Yildirim & Arslan, 2020) and that there may be differential psychological impacts across age (Park et al., 2020).

Aim

To extend on the research efforts investigating the psychological impact COVID-19, the aims of the current study are two-fold. First, in line with the SSO model, we test if disordered social media use predicts psychological wellbeing (as measured by stress and depression) in users during COVID-19 and test there is an indirect effect via fear of COVID-19. Specifically, we expect higher disordered social media use to predict lower psychological well-being indirectly through fear of COVID-19. Second, we also explore several risk and protective factors that may affect the relationship between fear of COVID-19 and psychological wellbeing, including age, gender, social connectedness, and resilience.

Figure 1: Graphical representation of the stressor-strain-outcome (SSO) model. Mediation results are also presented alongside the conceptual model, where * $p < .05$, ** $p < .01$, *** $p < .001$.

Method

Participants

There were 174 participants (88 male, 86 female) between the ages of 18 and 80 years ($M_{age} = 39.15$, $SD_{age} = 13.49$) who took part in the study. Participants included individuals over the age of 18 who were able to read English enough to complete the questionnaires.

Measures

Demographics. Demographic information collected included gender, age, and frequency of daily social media use (Ahorsu et al., 2020) pre- and during the COVID-19 pandemic.

The Social Media Disorder Scale. To assess disordered use of social media, we modified the 27-item Social Media Disorder Scale (SMD; Van Den Eijnden et al., 2016). The original lure of “During the past year, have you...” was modified to read, “During the COVID-19 pandemic, have you...”. Participants respond to items (e.g., “felt the need to use social media

more and more often?"; current $\alpha = .96$) with Yes (scored 1) or No (scored 0). A total score is calculated by summing responses, with higher scores indicating higher levels of disordered social media use. The SMD has previously generated excellent internal reliability ($\alpha = .90$ and $.92$; Van Den Eijnden et al., 2016).

Fear of COVID-19 Scale. Fear of COVID-19 was measured with the Fear of COVID-19 Scale (FCV-19S; Ahorsu et al., 2020). Participants respond to 7-items (e.g., "I cannot sleep because I'm worrying about getting coronavirus-19; current $\alpha = .92$) on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A total score is computed by summing the responses, with higher scores indicating greater fear of COVID-19. The FCV-19S has good previous internal reliability (Cronbach's $\alpha = .82$; Ahorsu et al., 2020).

Brief Resilience Scale. Resilience was measured with The Brief Resilience Scale (BRS; Smith et al., 2008). Participants respond to 6-items (e.g., "I tend to bounce back quickly after hard times"; current $\alpha = .81$) on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). After reverse scoring three items, a total score is calculated by computing averages, with higher scores indicating greater resilience. The BRS has good previous internal reliability ($\alpha = .80 - .91$) and validity (Smith et al., 2008).

Perceived Stress Scale. Perceived stress was measured with the Perceived Stress Scale-10 (PSS-10; Cohen et al., 1988). Participants respond to 10-items (e.g., "In the last month, how often have you felt that you were unable to control the important things in your life?"; current $\alpha = .78$) on a 5-point Likert scale, from 0 (Never) to 4 (very often), with four items reverse coded. Items are summed for total scores with higher scores indicating higher perceived stress. The PSS-10 is considered the most psychometrically valid version of the Perceived Stress Scales with good previous internal reliability ($\alpha = .78$) as well as construct validity (Cohen et al., 1988).

Revised Social Connectedness Scale. Social connectedness was measured with The Revised Social Connectedness Scale (SCS-R; Lee et al., 2001). Participants respond to 20-items (e.g., “I feel understood by people I know”) on a 6-point Likert-type scale, ranging from 1 (strongly disagree) to 6 (strongly agree). Responses are calculated for total scores, with higher scores reflecting a stronger sense of social connectedness. The SCS-R has demonstrated good psychometric properties with previous Cronbach’s alpha of $\alpha = .92$ (Lee et al., 2001). The present study indicated Cronbach’s alpha of $\alpha = .64$ for the SCS-R, which is below acceptable levels (Carmines & Zeller, 1979), so results should be viewed with caution.

Centre for Epidemiologic Studies Depression Scale. Finally, depressive symptoms in the past week were assessed with the Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Participants respond to 20 items (e.g., “In the past week I felt sad”; current $\alpha = .93$) on a 4-point rating scale ranging from 0 (rarely or none of the time) to 3 (most or all of the time). Responses are summed for total scores, with higher scores indicating greater feelings of depression. The CES-D is psychometrically sound with previous Cronbach’s alpha between .85-.94 (Carleton et al., 2013).

Procedures

After received ethical approval from the relevant university Human Research Ethics Committee, participants were recruited on social media (e.g., Facebook, Twitter, and Instagram) via a convenience sample and a snowballing technique to complete an anonymous, confidential online questionnaire hosted on Qualtrics. The initial Qualtrics survey page was the plain language statement, which indicated informed consent was implied upon questionnaire completion and took participants approximate 30 minutes to complete. As an incentive, participants were offered a chance to win one (of two) AU\$50 e-gift vouchers, which were

randomly drawn from the pool of fully completed questionnaires once the current data collection period completed. The online data collection period remained open for one month from May to June 2020 and a reminder post was sent out on social media to followers once a week. To prevent duplicate responses from participants, email addresses and IP addresses were checked.

Results

Data Analysis

Analyses were conducted using the software R (R Core Team, 2020). Means and SDs for all variables of interest are presented in Table 1 and all bivariate correlations are presented in Table 2. Before any inferential analyses were conducted, we noted that there were 24 participants (13%) with data missing. Ten participants had more than 40% of their data missing. After removing these 10 participants the total amount of data missing was 8%.

To deal with missing data we generated multivariate imputations by chained equations (MICE) using the “Mice” package. We created 10 additional data sets via multiple imputation using the predictive mean matching method with 20 iterations. All imputed data sets were inspected via density plots to ensure the imputation process produced plausible values. All analyses were conducted on each imputed data set and the parameter values for each analysis was pooled together by Rubin’s rules (Rubin, 1987). We present the pooled result.

Table 1

Descriptive Statistics

	Age	SMDS	FCV-19S	PSS	BRS	RSC-S	CES-D
	Males						
Mean	40.15	10.78	21.01	27.78	19.69	76.00	21.77
SD	13.42	10.15	7.59	7.20	4.91	18.04	14.67
	Females						
Mean	38.59	11.07	21.51	30.82	18.74	78.12	24.05
SD	13.60	9.33	7.12	5.59	4.94	15.66	12.43

Note. Age = age in years; SMDS = The Social Media Disorder Scale; FCV-19S = Fear of COVID-19 Scale; PSS = Perceived Stress Scale; BRS = Brief Resilience Scale; RSCS = Revised Social Connectedness Scale; CESD = Centre for Epidemiologic Studies Depression Scale.

The analysis process was split into two parts. First, we ran two mediation models using the "lavaan" package in R. The mediation analyses explored the possible indirect relationships between disordered social media use and negative emotional states (i.e., depression symptomatology and perceived stress) via fear of COVID-19. To test for the existence of indirect effects in the mediation models we used bootstrap confidence intervals computed from 1000 naïve bootstrap draws. Confidence intervals were generated for each imputed dataset and then averaged over the imputed data sets (Wei Wu & Fan Jia, 2013). Second, we used a series of hierarchical regressions to test if fear of COVID-19 predicted negative emotional states and if this relationship was moderated by age, gender, social connectedness, or resilience. To aid with interpretation of interaction terms, all regression predictors and response variables

were mean centred prior to all analyses and nested model testing in the multiple imputed data sets was conducted via likelihood ratios (Meng & Rubin, 1992).

Table 2

Correlations for Study Variables

Variable	1	2	3	4	5	6	7
1. CESD	—	.64***	.58***	.63***	.57***	.60***	.23**
2. SMDS		—	.50***	.27**	-.26**	-.21*	-.26**
3. FCV19S			—	.49***	-.34***	-.43***	-.04
4. PSS				—	-.59***	-.50***	-.26***
5. BRS					—	.55***	.15
6. RSCS						—	.03
7. AGE							—

Note. Person coefficient values are provided in each cell along with asterisks flagging significant correlations, where * $p < .05$, ** $p < .01$, *** $p < .001$.

Social Media and Negative Emotional States

In the first mediation model, disordered social media use predicted perceived stress while controlling for the indirect effect, $b = 0.191$, 95% CI: 0.095 – 0.288, $t(169.704) = 3.877$, $p < .001$. There was also an indirect effect in the model ($b = 0.165$, 95% CI: 0.097 - 0.232). All other paths are summarised in Figure 1. In the second mediation model, disordered social media use predicted depression scores while controlling for the indirect effect, $b = 0.910$, 95% CI:

0.749 – 1.070, $t(169.641) = 11.080$, $p < .001$. There was an indirect effect in the model ($b = 0.248$, 95% CI: 0.138 - 0.358). All other paths are also summarised in Figure 1.

Risk and Protective Factors

Given the results of the mediation analyses, we also explored whether the relationship between fear of COVID-19 and perceived stress scores is moderated by other risk and protective factors. Our null model for this analysis had perceived stress scores regressed onto age, gender, brief resilience scores, social connectedness scores, disordered social media use, and fear of COVID-19. We then tested four moderation models that included an interaction term between fear of COVID-19 and either age, gender, brief resilience scores, or social connectedness scores. The age moderation model was the only model that had a change in R^2 and it accounted for 55% of the variance in perceived stress ($R^2 = 0.550$, 95% CI: 0.440 - 0.645, $\Delta R^2 = 0.022$, $d' = 7.842$, $p = 0.005$). In the moderation model, there was an interaction between age and fear of COVID-19, $b = .011$, 95% CI: 0.003 - 0.019, $t(152.96) = 2.766$, $p = .006$. Examination of the interaction plot (i.e., Figure 2) showed that the positive relationship between fear of COVID-19 and perceived stress was strongest for older participants compared to younger participants. All parameter estimates of the age moderation model are presented in Table 3.

Figure 2: Perceived stress scores as a function of fear of COVID-19. The three separate regression lines show regression model predictions for young (red), middle age (green), and old (old) participants. Dots represent the raw data.

We also explored whether the relationship between fear of COVID-19 and depression scores was moderated by the same risk and protective factors mentioned above. Our null model for this analysis had depression scores regressed onto age, gender, brief resilience scores, social connectedness scores, disordered social media use, and fear of COVID-19. We then tested four moderation models that included an interaction term between fear of COVID-19 and either age, gender, brief resilience scores, or social connectedness scores. No moderation models improved the model fit relative to the null model.

Table 3

Moderation Model Parameter Estimates

						2.5 %	97.5 %
	<i>B</i>	SE	<i>t</i>	df	<i>p</i>	CI	CI
PSS Model							
Constant	-2.975	1.138	-2.614	152.303	0.010	-5.223	-0.726
Age	-0.085	0.029	-2.943	152.592	0.004	-0.142	-0.028
Gender	1.977	0.727	2.719	151.857	0.007	0.54	3.414
BRS	-0.426	0.090	-4.719	152.534	0.001	-0.604	-0.248
RSCS	-0.090	0.027	-3.307	152.469	0.001	-0.144	-0.036
FCV19S	0.247	0.065	3.779	152.407	0.001	0.118	0.376
SMDS	-0.022	0.047	-0.459	151.630	0.647	-0.114	0.071
Age × FCV19S	0.011	0.004	2.762	152.963	0.006	0.003	0.019

Note. Age = age in years; SMDS = The Social Media Disorder Scale; FCV-19S = Fear of COVID-19 Scale; PSS = Perceived Stress Scale; BRS = Brief Resilience Scale; RSCS = Revised Social Connectedness Scale; CES-D = Centre for Epidemiologic Studies Depression Scale.

Discussion

The current study investigated the relationship between disordered social media use and psychological wellbeing (i.e., stress and depression) during COVID-19 (May – June, 2020). We also explored if the relationship between disordered social media use and psychological wellbeing occurred indirectly via fear of COVID-19. In line with our hypotheses, we found that disordered social media use positively predicted perceived stress and depression scores indirectly

through fear of COVID-19. As a follow up we explored several risk and protective factors and found age was a moderator of fear of COVID-19 and stress.

This research was guided by the stressor-strain-outcome model (SSO; Koeske & Koeske, 1993) that has been used to explore social media use and outcomes in the past (Cao et al., 2018; Lee et al., 2016). Under this model, the increased social media use (i.e., stressor) is related to perceived stress and depression symptomatology (i.e., outcomes). Moreover, the relationship between stressor and outcome occurs indirectly via the fear of COVID-19 (i.e., strain). We noted that the fear of COVID-19 is an important strain because reading or hearing about the severity and contagiousness of COVID-19 is known to be stress inducing (Park et al., 2020). However, the fear of covid-19 scale used does not classify hearing and reading about COVID-19 as a measure of fear of COVID-19 (Addo et al., 2020). Our results supported the SSO model, where social media predicts perceived stress indirectly through fear of COVID-19. This could mean that during the COVID-19 pandemic, the impact of social media use on our perceived stress may predominantly be driven by increased fear of COVID-19. On the other hand, social media use has a direct relationship with depression scores and this relationship also occurs indirectly by fear of COVID-19. Therefore, like stress, disordered social media use is related to depression symptoms via fear of COVID-19, but a direct relationship between this use and depression also exists. This independent relationship between social media use and depression symptoms corroborates previous research (e.g., Shensa et al., 2017); however, it should be noted that this previous research found that it was frequency of use – not overall time – that predicted depression symptoms. As the Social Media Disorder Scale used to assess disordered social media use in the current study includes several subscales, such as preoccupation, escape, and

displacement, future research should seek to establish the direct relationship between these elements of disordered social media use and subsequent depression symptoms.

Regarding risk and protective factors, we only found that the positive relationship between fear of COVID-19 and perceived stress is stronger for older people than younger people. This may appear to contradict other research, such as the survey data in the United States that suggests younger people are more stressed about COVID-19 overall than older people (Park et al., 2020). However, in Table 2 we presented correlations that indicated as people age their perceived stress levels decrease, which is in line with USA survey data (Park et al., 2020). As these results indicate that age is a risk factor for how much fear of COVID-19 is associated with perceived stress, an important implication of the current study is consideration of how we support older social media users. Parties interested in conducting social media interventions for older adults should note the possible negative consequences of harmful information distributed via online communities, especially for older users.

The results of this study were cross-sectional and provide an insight into how social media is related to psychological well-being at a single point in time during COVID-19. In this study the design limited our exploration to indirect effects between stressors, strains and outcomes. We aim to collect follow up data that will allow us to model changes in the relationships reported here over time. This follow up data will allow us to confirm the model we have tested here and test for mediation.

Overall, there is little doubt that the impact of the COVID-19 pandemic is affecting the physical, psychological, and emotional health of individuals worldwide. Results of the current study indicate that disordered social media usage during the pandemic could impact

psychological wellbeing and this may be exacerbated by content on social media that promotes the fear of COVID-19.

Author Disclosure Statement

No competing financial interests exist.

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