



The role of perceived social support on depression and sleep during the COVID-19 pandemic



Ian Grey^{a,*}, Teresa Arora^b, Justin Thomas^b, Ahmad Saneh^a, Pia Tohme^a, Rudy Abi-Habib^a

^a School of Arts & Social Sciences, Lebanese American University, Lebanon

^b Zayed University, College of Natural & Health Sciences, Abu Dhabi, U A E

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ABSTRACT

The aim of the present study was to examine the role of perceived social support pertaining to a range of psychological health outcomes amongst individuals undergoing social isolation and social distancing during COVID-19. A total of 2,020 participants provided responses to an online cross-sectional survey comprised of validated instruments including the Multidimensional Scale of Perceived Social Support (MSPSS), the Generalized Anxiety Disorder Scale (GAD-7), the Patient Health Questionnaire (PHQ-9), the Brief Irritability Test (BITe) and the UCLA Loneliness Scale (UCLA-LS). Individuals experiencing self-isolation had significantly higher rates of depression, irritability and loneliness compared to those who were not. The risk for elevated levels of depression symptoms was 63% lower in individuals who reported higher levels of social support compared to those with low perceived social support. Similarly, those with high social support had a 52% lower risk of poor sleep quality compared to those with low social support. Social support was found to be significantly associated with elevated risk for depression and poorer sleep quality. The results contribute to our understanding of differential psychological outcomes for individuals experiencing anti-pandemic measures.

1. Introduction

In the immediate wake of the announcement by the WHO regarding the COVID-19 pandemic, many countries sanctioned a range of measures to protect public health including social distancing and social isolation which helped to avert an increase of COVID-19 incidence (Nussbaumer-Streit et al., 2020). However, mental health professionals have highlighted the possible range of negative mental health effects associated with these measures based on previous epidemic situations (Brookes et al., 2020; Holmes et al., 2020; Li et al., 2020; Mahase, 2020; Xiang et al., 2020). Unfortunately, whilst such measures may be efficacious for minimizing the physical spread of the virus, social distancing and self-isolation measures are documented risk factors for the onset and exacerbation of mental health issues (Holmes et al., 2020).

Anti-pandemic measures disrupt social interconnectedness and this is not only associated with an increased risk of psychological difficulties, but has been previously linked to early mortality (Holt-Lunstad, et al., 2015). The emerging research related to mental health and COVID-19 points to an elevated incidence of negative psychological effects amongst healthcare workers (Bo et al., 2020), COVID-infected patients (Huyen et al., 2020) as well as the general population (Xiao et al., 2020) with anxiety and depression occurring most

frequently (Wang et al., 2020; Gao et al., 2020; Tan et al., 2020). Other groups have demonstrated the downstream consequence of COVID-19 upon sleep quality (Xiao & Yhang, 2020), which is a known driver for the onset and progression of poorer mental health outcomes (Baglioni et al., 2011).

To date, the specific factors propelling poorer levels of mental health observed during the current pandemic remain largely unknown (Holmes et al., 2020). Some have suggested that increased social media exposure may be partly responsible (Gao et al., 2020) whilst others have pointed to the duration of social isolation as an important factor (Brookes et al., 2020; Pursell et al., 2020; Hawryluch et al., 2004). One particular topic that has also been the focus of some interest during the current pandemic has been the role of social support and its role as a psychosocial protective factor in relation to mental health difficulties. To date social support has been broadly construed in two ways: perceived social support and received social support (Eagle et al., 2019). Perceived social support concerns the subjective evaluation of how individuals perceive friends, family members as available to provide material, psychological and overall support during times of need whereas received support relates to the actual quantity of support received. This distinction between these two types of support is important for two reasons. Firstly, perceived social support measures are designed

* Corresponding author.

E-mail address: iangrey058@gmail.com (I. Grey).

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to assess individual perceptions concerning the general availability and adequacy of support and/or global satisfaction with support provided whereas measures of received support targets the specific supportive behaviours that are provided to individuals by their social support networks (Eagle et al., 2019). Secondly, a sizeable body of research indicates that perceived social support is only modestly correlated with measures of received support (Haber et al. 2007; Lakey et al., 2010). Furthermore, existing meta-analytic studies examining the relationship between these two types of support do not support the traditional view that received support is the primary constituent factor in perceived support (Haber et al., 2007). Indeed, social cognitive theories in this domain describe cognitive, judgment, and perceptual processes involved in support appraisals and challenge the notion that support perceptions are primarily determined by specific, objectively identifiable events (Kaul & Lakey, 2003; Procidano, 1997). While there is a strong and well-validated relationship between poorer mental health and low levels of perceived social support (Lakey & Cronin, 2008; Liang, Krause, & Bennett, 2001), the relationship between received social support and mental health outcomes appears to be weak (Lakey et al., 2010; Son, Lin, & George, 2008; Uchino, 2009).

Several recent studies have evaluated the role of perceived social support during the COVID-pandemic. Higher ratings of perceived social support from family are reported as being associated with lower levels of depression and PTSD (Liu et al., 2020). Moreover, medical staff who report higher levels of perceived social support also report increased self-efficacy and sleep quality and reduced anxiety and stress (Xiao et al., 2020). Thus, increased levels of perceived social support may mitigate the effects of social isolation and social distancing measures (Zhang & Ma, 2020). In non-pandemic situations, positive associations between social support and psychological well-being among adults and youth have been documented (Peirce et al., 2000). Furthermore, inverse associations have been observed between social support and depression, and tentatively with schizophrenia, bipolar disorder and anxiety disorders (Wang et al., 2018). Unfortunately, the role of perceived social support pertaining to mental health and related behaviors during the current pandemic remains largely absent. A better understanding of the role played by perceived social support is therefore important amongst individuals experiencing anti-pandemic measures during COVID-19.

In light of the foregoing discussion, the primary objective of our study was to examine the role of perceived social support in relation to depression, anxiety, irritability and sleep quality amongst individuals undergoing social isolation during the COVID-19 outbreak. Based on the existing literature, we hypothesized that lower levels of perceived social support would be associated with an increased risk of anxiety and depressive symptoms as well as poorer sleep quality.

2. Method

2.1. Participants

A total of 2,020 individuals provided consent to participate in the study. Demographic information was collected pertaining to age group (years), gender, current living arrangements, family income, social isolation, duration of social isolation (weeks), relationship status, educational level, current occupational status, presence of underlying medical conditions, and whether the person knew somebody personally who had contracted COVID-19.

2.2. Procedure

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board at the first authors university (Approval number: LAU.SAS.IG6.2/Apr/2020). All participants indicated their consent after being presented with study-related information. A cross-sectional design was utilized and the web

Table 1
MSPSS Factors and Item Content.

Family
My family really tries to help me
I get the emotional help and support I need from my family
I can talk about my problems with my family
My family is willing to help me make decisions
Friends
My friends really try to help me
I can count on my friends when things go wrong
I have friends with whom I can share my joys and sorrows
I can talk about my problems with my friends
Significant Other
There is a special person who is around when I am in need.
There is a special person with whom I can share my joys and sorrows.
I have a special person who is a real source of comfort to me.
There is a special person in my life who cares about my feelings.

link was disseminated through social media platforms and email. Survey Monkey is an online platform which was used to collect the data online.

2. 3 Measures

2.3.1. The Multidimensional Scale of Perceived Social Support (MSPSS)

The MSPSS is a 12-item scale that measures perceived adequacy of social support from three domains: family, friends, and significant others (Zimet et al., 1990). It has a three factor structure with each subscale comprising four items addressing practical help, emotional support, availability to discuss problems and help in decision making (see Table 1).

Participants are asked to indicate their agreement with items on a seven-point Likert scale, ranging from very strongly disagree to very strongly agree yielding a score range from 12 to 84. Scores from 12–48 indicate low social support, scores from 49–68 indicate moderate social support, and scores from 69–84 indicate high social support. Several studies indicate that the measure possesses adequate psychometric properties in adults (Dambi et al., 2018; Lakshmi et al., 2020; Zimet et al., 1990). In the present study, Cronbach's alpha coefficient and the intra-class correlation coefficient (ICC) for this tool were 0.89 and 0.92, respectively.

2.3.2. Generalized Anxiety Disorder (GAD-7)

The GAD-7 is one of the most frequently used diagnostic self-report scales for screening, diagnosis and severity assessment of anxiety disorder (Spitzer et al., 2006; Jordan et al., 2017). Responders are asked to rate the frequency of anxiety symptoms in the last two weeks on a Likert scale ranging from 0–3 (0 = not at all, 1 = several days, 2 = more than half the days and 3 = nearly every day). Items are summed to provide a total score ranging from zero to 21 yielding a total anxiety score. Severity can be determined by the following cut-off scores; 1–4 minimal symptoms, 5–9 mild symptoms, 10–14 moderate symptoms and 15–21 severe symptoms. The GAD-7 has been subjected to numerous psychometric evaluations and is reported to have good reliability and validity across different population groups (Johnson et al., 2019). The measure also has good internal consistency (Cronbach $\alpha = .92$) and test-retest reliability is adequate (intra-class correlation = 0.83; Spitzer et al., 2006). In the present study, Cronbach's alpha coefficient was high (Cronbach $\alpha = .91$).

2.3.3. Patient Health Questionnaire (PHQ-9)

The PHQ-9 is the nine-item depression self-report module from the full Patient Health Questionnaire (Spitzer, Kroenke & Williams, 1999). Each item is rated from 0 to 3 based on frequency of each symptom over the previous 2 weeks (0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day). As a severity measure, the

PHQ-9 score can range from 0 to 27). The widely used cut-off scores for the measure are 0–4 (none to low anxiety), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe) and 20–27 (severe; [Urtasun et al., 2019](#)). The initial validation study reported a Cronbach's α of 0.89 ([Kroenke, Spitzer & Williams, 2001](#)) and subsequent validation studies point to strong reliability and validity of the measure ([Darlay et al., 2019](#); [McCord & Frost, 2020](#)). In the present study, Cronbach's alpha coefficient was high (Cronbach $\alpha = .89$).

2.3.4. UCLA Loneliness Scale (UCLA-LS)

This is a three-item scale assessing loneliness derived from an original 20 item measure ([Hughes et al., 2004](#)). The three items on the measure were selected because they showed the highest loading on each respective factor of a three-factor model based on the original measure ([Hughes et al., 2004](#); [Arimoto & Takada, 2019](#)). Responders are asked to indicate how they currently feel in three domains: relational connectedness, social connectedness and perceived self-isolation by indicating, hardly ever feel this way (1), some of the time and (2) often feel this way (3). Scores range from 3 to 9 and total scores between 3–5 are categorized as “not lonely” and total scores between 6–9 are categorized as “lonely”. The three-item version is reported to be reliable and valid ([Hughes et al., 2004](#)). Subsequent studies indicate that the instrument has good validity and reliability ([Saito et al., 2019](#); [Vasser & Crosby, 2008](#)). In the present study, Cronbach's alpha coefficient was moderate (Cronbach $\alpha = .67$).

2.3.5. Brief Irritability Test (BITe)

This is a five-item measure designed to measure irritability ([Holtzman et al., 2015](#)). Responders are asked to indicate how often they have felt or behaved during the previous two weeks, including today. Each item is rated on a six-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often, 6 = always) yielding a score range from 5 to 30. The scale has demonstrated high internal consistency (Cronbach's alpha $\geq .88$; [Holtzman et al., 2015](#)). The instrument is reported to have adequate convergent and concurrent validity ([Holtzman et al., 2015](#)). In the present study, Cronbach's alpha coefficient was high (Cronbach $\alpha = .89$).

2.3.6. Pittsburgh Sleep Quality Index (PSQI)

This is a self-rated questionnaire which assesses sleep quality and disturbances over a one-month time interval ([Buysse et al., 1989](#)). Nineteen individual items generate seven “component” scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of the seven subscales are added to derive a global score (0–21) which can be subsequently dichotomized into good (≤ 5) and poor (> 5) sleep quality. The instrument is reported to have good psychometric properties ([Buysse et al., 1991](#); [Dietch et al., 2016](#)).

2. 4 Statistical Analysis

All statistical analyses were conducted using Stata, version 13. Scores for depression (PHQ-9), anxiety (GAD-7), irritability (BITe) and loneliness (UCLA-LS) and perceived social support (MSPSS) were visually inspected and were approximately normally distributed. Differences between those experiencing quarantine with those who were not were assessed in addition to gender differences on the above measures. To assess the differences between levels of perceived social support in relation to demographics as well as the main variables of interest, chi square and one-way ANOVA were used, as appropriate. A series of Pearson's bivariate correlations were performed to assess the relationships between levels of depression, anxiety, perceived social support, loneliness, sleep quality and irritability. A series of multivariate logistic regression analyses were conducted to assess if the independent variable of perceived social support level (using low as the referent) could predict the following three dependent variables: 1)

Depression (applying a cut point of ≥ 10 to indicate moderate-severe depression, where < 10 was used as the referent); 2) Anxiety (applying a cut point of ≥ 10 to indicate moderate-severe anxiety, where < 10 was used as the referent); 3) Sleep quality (using ≤ 5 as the referent category). Three statistical models were created where model 1 was univariate, model 2 was adjusted for age and gender, model 3 was further adjusted for demographic variables (living arrangements, education level, income, living with children under 8 years), duration of lockdown (weeks), if they knew someone personally affected by COVID-19 (yes/no), chronic condition (yes/no), as well as depression, anxiety and sleep quality, as appropriate. All covariates were selected *a priori* during the planning stage of our study and were based on current scientific evidence. P values of $< .05$ were considered statistically significant for all two-tailed tests.

3. Results

Of the 1,655 participants who provided information about self-isolation, 17% ($n = 277$) were not self-isolating at the time of responding and 83% ($n = 1,378$) were. The first step in the analysis involved comparing scores for depression (PHQ-9), anxiety (GAD-7), irritability (BITe), loneliness (UCLA-LS) and perceived social support (MSPSS) between those who reported being in quarantine/expiring self-isolation and those who were not. There were no differences between the two groups on scores of perceived social support $t(1356) = -.87, p = .32$ and on anxiety $t(1257) = 1.74, p = .08$. Significant differences were observed between the two groups with respect to depression $t(1315) = 2.27, p = .007$, irritability $t(1381) = 3.36, p = .001$ and loneliness $t(1352) = 1.99, p = .04$. In summary, those experiencing quarantine had higher scores on depression, irritability and loneliness relative to those not experiencing quarantine.

A total of 60% of those experiencing self-isolation ($n = 827$) reported that their mental health had deteriorated since lockdown measures were enforced, while 27% felt it remained the same and just 13% felt it had improved. To test these differences, an independent between-groups ANOVA was implemented in respect of depression scores which yielded a statistically significant result $F(1,1094) = 182.00, p = .000$. To evaluate the nature of these differences between the three groups further, a series of Fishers LSD post hoc tests was conducted. The difference between those who felt their mental health had deteriorated and those who felt it had remained the same was significantly significant $t(1095) = 6.93, p = .00$ as was the difference with those who felt their mental health had improved $t(1095) = 7.77, p = .00$.

In order to test for gender differences across depression, anxiety, irritability, loneliness and social support a series of between-groups ANOVA's were conducted (see [Table 2](#)). In respect of depression, an independent between-groups ANOVA yielded a statistically significant result ($F(1,1098) = 44.13, p = .000$). A significant result was also observed in relation to anxiety ($F(1,1069) = 64.21, p = .000$), irritability ($F(1,1153) = 42.15, p = .000$) and perceived social support $F(1,1135) = 6.43, p = .011$. In summary, females scored higher on

Table 2
Means, Standard Deviations, and One-Way Analyses of Variance on Gender and Psychological Status.

Measure	Male		Female		F(1, 1135)	Sig.
	M	SD	M	SD		
MDPSS	55.71	14.20	57.83	13.74	6.43**	.011
GAD-7	8.20	5.77	11.10	64.21	89.41***	.000
BITe	16.15	5.18	18.20	5.53	42.15***	.000
UCLA Loneliness	6.48	1.72	6.54	.351	.554	.38
PHQ-9	11.23	6.54	13.88	6.62	44.13***	.000

** $p < .05$.

*** $p < .001$.

Table 3
Characteristics of participants enrolled to the study according to perceived social support status.

Characteristic	Perceived social support			P value
	Low	Moderate	High	
Gender				.024
Male	200 (26.25)	422 (55.38)	140 (18.37)	
Female	147 (24.58)	305 (51.00)	146 (24.41)	
Prefer not to say	13 (39.39)	16 (48.48)	4 (12.12)	
Age (years)				.004
18–24	312 (26.67)	634 (54.19)	224 (19.15)	
25–34	30 (21.74)	63 (45.65)	45 (32.61)	
35+	17 (22.37)	39 (51.32)	20 (26.32)	
Relationship Status				<.001
Single	291 (32.36)	471 (52.22)	140 (15.52)	
In a relationship	64 (13.42)	265 (55.56)	148 (31.03)	
Separated	2 (50.00)	1 (25.00)	1 (25.00)	
Widowed	0 (0.00)	1 (100.00)	0 (0.00)	
Divorced	3 (37.50)	4 (50.00)	1 (12.50)	
Education level				.021
Some high school	61 (29.05)	111 (52.86)	38 (18.10)	
High school	218 (26.68)	448 (54.83)	151 (18.48)	
Bachelor's degree	49 (20.00)	128 (52.24)	68 (27.76)	
Master's degree	11 (20.75)	26 (49.06)	16 (30.19)	
PhD	2 (15.38)	8 (61.54)	3 (23.08)	
Other	19 (34.55)	22 (40.00)	14 (25.45)	
Know someone with COVID-19				.220
Yes	81 (22.38)	200 (55.25)	81 (22.38)	
No	277 (26.95)	542 (52.72)	209 (20.33)	
Living with children under age 8 years				.040
Yes	33 (32.67)	59 (58.42)	9 (8.91)	
No	229 (26.91)	461 (54.17)	161 (18.92)	
GAD-7	11 (6)	9 (6)	8 (6)	<.001
PHQ-9	15 (7)	12 (6)	10 (6)	<.001
UCLA Loneliness Scale	7 (2)	6 (2)	5 (2)	<.001
BITe	18 (6)	17 (5)	15 (5)	<.001
PSQI	9 (4)	8 (3)	7 (4)	<.001

Data are presented as n (%), or mean (SD). GAD = Generalized Anxiety Disorder; PHQ = Patient Health Questionnaire; PSQI = Pittsburgh Sleep Quality Index; BITe = Brief Irritability Test.

measures of depression, anxiety, irritability and social support.

Demographic characteristics along with the outcomes of interest are presented in Table 3, stratified by level of perceived social support (low, moderate, high). In brief, those aged 25–34 years reported the highest levels of social support (32.61%) compared to 19.15% in 18–24 year olds, and 26.32% in those who were 35 years or older, $X^2(4) = 15.15$, $p = .004$. The mean scores for anxiety, depression, loneliness, irritability and sleep quality were all significantly different across the three levels of perceived social support ($p < .001$ for all) demonstrating the protective nature of perceived social support upon the mental health outcomes of interest as well as sleep and loneliness.

The correlation matrix is shown in Table 4 which highlights the relationships between the two mental health variables (depression and

Table 4
Correlation matrix to assess the relationships between the main variables of interest.

	Social support	Anxiety	Irritability	Loneliness	Depression	Sleep
Social support	1.00					
Anxiety	-.17*	1.00				
Irritability	-.23*	.67*	1.00			
Loneliness	-.46*	.35*	.37*	1.00		
Depression	-.30*	.72*	.63*	.45*	1.00	
Sleep	-.21*	.52*	.40*	.28*	.57*	1.00

* $p < .001$.

Table 5
Multivariate logistic regression analyses to assess the associations between social support and depression, anxiety and sleep quality.

	Model 1	Model 2	Model 3
Depression			
Low social support	1.00	1.00	1.00
Moderate social support	.53 (.40–.70)	.52 (.39–.70)	.58 (.36–.93)
High social support	.29 (.20–.40)	.25 (.18–.36)	.37 (.21–.67)
Anxiety			
Low social support	1.00	1.00	1.00
Moderate social support	.74 (.57–.96)	.73 (.56–.97)	1.10 (.72–1.67)
High social support	.45 (.32–.63)	.40 (.28–.57)	.91 (.51–1.60)
Poor Sleep Quality			
Low social support	1.00	1.00	1.00
Moderate social support	.47 (.32–.68)	.48 (.33–.69)	.52 (.31–.88)
High social support	.34 (.22–.52)	.33 (.22–.51)	.48 (.26–.88)

Data are presented as odds ratio (OR) and 95% confidence intervals (95% CI). Model 1: unadjusted.

Model 2: adjusted for age and gender.

Model 3: further adjusted for living arrangement, education level, income, living with children under 8 years old, chronic illness, knowing someone personally affected by COVID-19, and depression, anxiety and sleep quality, as appropriate.

anxiety), sleep quality, loneliness and irritability. Briefly, the strongest correlation was observed between depression and anxiety, where $r = .72$, $p < .001$. Pertaining to perceived social support, significant negative correlations were observed for all variables, with loneliness having the strongest relationship, where $r = -.46$, $p < .001$.

A series of logistic regression analyses were conducted to assess if social support level could predict either depression, anxiety or sleep quality (see Table 5). Results indicate that perceived social support level was a protective factor for depression and poor sleep quality. The strongest effect size was observed amongst those with high perceived social support in relation to depression, the risk for depression was 63% lower compared to those with low perceived social support (OR = .37 [95% CI: .21–.67]), after full adjustment of potential confounders. Similarly, those with high social support had a 52% lower risk of poor sleep quality compared to those with low social support, after adjustment (OR = .48 [95% CI: .26–.88]). Anxiety was also significantly associated with perceived social support but after full adjustment (model 3), the relationship was attenuated and became non-significant.

4. Discussion

Researchers have been quick to document the range of mental health effects associated with measures to contain the COVID-19 pandemic (Brooks et al., 2020). To date, elevated levels of depression and anxiety have been reported in the general population in addition to gender differences (Liu et al., 2020). It appears from the current study that the experience of quarantine is likely to result in elevated levels of depression, irritability and loneliness in contrast to those who are not experiencing quarantine. Furthermore, females scored higher on measures of depression, anxiety, irritability and loneliness in contrast to males which is consistent with recent studies (Wang et al., 2020). However, what is also apparent from these emerging studies is that while relatively large numbers of individuals are adversely affected, a substantial number of individuals are not, which raises the question as to why there is a differential response across individuals. The results of the current study may contribute to a more nuanced understanding of this issue. Several existing meta-analytic reviews addressing the relationship between social support and mental health suggest that the presence of such support predicts better mental health functioning and can also be regarded as a protective factor against the onset of mental health difficulties (De Silva et al., 2005; Harandi, Taghinasab, & Nayeri, 2017). More specifically, it has been proposed that high quality social support can enhance resilience to stress and help protect against

developing trauma-related psychopathology (Ozbay et al., 2007). In the current study, perceived social support was observed to have significant inverse associations with anxiety, depression, loneliness, irritability and quality of sleep with higher levels of support related to lower scores on measures of these specific outcomes. Of particular interest is the relationship between social support and depression as the latter is perhaps the most commonly assessed index of mental health status during the current pandemic. Results of the current study indicate that the risk for depression was 63% lower compared to those with low perceived social support (OR = .37 [95% CI: .21–.67] when adjusted for age, gender, living arrangement, education level, and presence of chronic condition or illness. A similar pattern was observed in respect of sleep quality with those reporting high levels of social support having a 52% lower risk of poor sleep quality compared to those with low social support (OR = .48 [95% CI: .26–.88]). These results point to a quite substantial effect of perceived social support both on depression and also in relation to sleep quality which is line with recent meta-analytic reviews which also indicate a robust association between social support and sleep outcomes (Kent de Grey et al., 2018). Previous research also suggests that perceived social support is a significant predictor of depressive symptoms (Alsubaie et al., 2019).

In respect of limitations, the current study focused solely on the relationship between perceived social support, mental health and sleep. Whilst the existing literature suggests that perceived social support has a more robust relationship with mental health outcomes than received support, what remains unanswered is the question as to what combination of contextual and intra-individual factors lead to appraisals of social support, whether these be high or low, for individuals experiencing anti-pandemic measures. In light of research which clearly suggests that received support is only modestly related to perceived support it has been proposed that individuals who report higher levels of perceived social support may have what has been termed a 'positive psychological profile' (Uchino, 2009), which entails they are more likely to evaluate any form of received social support in a more positive manner. As such, future research investigating the role social support during anti-pandemic measures may benefit from the examination of personality characteristics such as resilience and coping styles in the context of how individual access and receive support to provide a more complete understanding of perceived social support during a pandemic situation. Changes in perceived social support across the duration of the pandemic would also be of interest as previous research suggests that declines in perceived support are inversely associated with changes in depressive symptoms.

CRedit authorship contribution statement

Ian Grey: Conceptualization, Writing - original draft, Formal analysis, Methodology, Software. **Teresa Arora:** Writing - original draft, Formal analysis. **Justin Thomas:** Conceptualization. **Ahmad Saneh:** Project administration, Data curation, Software. **Pia Tohme:** Conceptualization, Writing - review & editing. **Rudy Abi-Habib:** Conceptualization, Writing - review & editing.

Declaration of Competing Interest

The authors declare no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi: [10.1016/j.psychres.2020.113452](https://doi.org/10.1016/j.psychres.2020.113452).

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