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Hardiness moderates the effects of COVID-19 stress on anxiety and depression

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ABSTRACT

The COVID-19 pandemic has led to sharp increases in mental health problems around the world, most notably in anxiety and depression. The present study examines hardiness and age as potential protective factors against the mental health effects of COVID-related stress. A sample of Canadians balanced across age and gender, completed an online survey including measures of COVID related stressors, hardiness, depression, and anxiety, along with age, gender, and other demographics. Conditional PROCESS analysis showed that COVID stressors led to significant increases in anxiety and depression. Hardiness moderated these relations, with those high in hardiness showing less anxiety and depression. Age was negatively related to anxiety and depression, with highest levels observed among the younger respondents. At the same time, a moderating effect of age was found with respect to depression, with older people showing sharper increases in depression as COVID-related stress goes up. Gender was not a significant factor in any of these relations, meaning that the results apply equally well to both women and men. This study provides evidence that younger people who are also low in hardiness are most vulnerable to developing anxiety and depression while under COVID stress, and so would likely benefit from preventive intervention strategies. While anxiety and depression symptoms are highest among the young, older age groups appear more vulnerable to increasing rates of depression symptoms related to COVID stress. Clinicians and practitioners should thus be especially vigilant for COVID related increases in depression among older people, and those low in psychological hardiness.

1. Introduction

The COVID-19 pandemic has led to sharp increases in mental health problems around the world, most notably in anxiety and depression. In addition to fears of infection and possible death, the pandemic has brought on a range of restrictions and economic disruptions that have contributed to social isolation, loss of regular activities, confinement, and financial hardships for people around the world. For example, a recent systematic review of studies in multiple countries reports high rates of symptoms of anxiety (up to 50.9 %) and depression (up to 43.3 %) associated with the COVID pandemic (Xiong et al., 2020). In another review of 47 studies looking at mental health effects of COVID-19, 77 % report a significant relationship with anxiety symptoms, and 56 % with depression symptoms (Machado et al., 2020). Other reviews have noted increased depression, anxiety and sleep problems among health care

workers, and higher anxiety and depression symptoms in the general population (Vindegaard and Benros, 2020).

Despite these disturbing numbers, there are many people who are not experiencing mental health problems despite experiencing the stressors of COVID. It is thus important to have a better understanding of what factors distinguish these healthier responders. The present study contributes to this goal by examining hardiness and age as potential resilience or protective factors against the mental health effects of COVID-related stress.

Hardiness is a personality factor or mindset that contributes to resilience under stress (Eschleman et al., 2010; Stein and Bartone, 2020). Other factors like social support can also influence resilience (Kobasa et al., 1985), but research suggests that hardiness is the primary “inside the person” contributor to resilient responding (Bartone et al., 2016). While hardiness is modestly related to certain Big Five

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personality factors, it also functions independently to predict important outcomes (Bartone et al., 2009). People high in hardiness have a strong sense of *commitment* and purpose in life, believe they can *control* or influence outcomes, and see changes and disruptions in life as *challenges* to overcome and learn from (Bartone, 2006). Hardiness has been found to be a protective factor against stress-related problems in many occupations, including executives (Maddi and Kobasa, 1984), bus drivers (Bartone, 1989), nurses (Abdollahi et al., 2014), police (Allison et al., 2019), students (Hystad et al., 2009), and military personnel (Bartone, 1999; Britt et al., 2001). For example, a study of veterans of the wars in Iraq and Afghanistan found that (low) hardiness was a significant predictor of suicidal ideation (Pietrzak et al., 2010). Previous research on hardiness and anxiety has shown that hardiness is associated with lower levels of anxiety (Kovács and Borcsa, 2017; Kowalski and Schermer, 2019). Thus, we expected that people high in hardiness would report lower levels of anxiety related to COVID stress:

Hypothesis 1. COVID-related stress is related to increased anxiety.

Hypothesis 1a. Hardiness operates as a moderator in the stress-anxiety relation.

Prior research has also shown that COVID related stressors are associated with increased depression and anxiety in many people (Lakhan et al., 2020; Woon et al., 2021). Studies have also shown that hardiness is linked to lower levels of depression under a range of stressful conditions (Bartone and Homish, 2020; Clark, 2002; Maddi et al., 2006; Ng and Lee, 2019; Sinha and Singh, 2009). This leads to the following hypotheses:

Hypothesis 2. COVID-related stress is related to increased depression.

Hypothesis 2a. Hardiness operates as a moderator in the stress-depression relation.

In addition, we test whether there are gender differences in the COVID stress – depression / anxiety relation. Multiple studies have identified women to be at higher risk for anxiety and depression as a consequence of the COVID pandemic. For example, a recent report on a fairly large sample ($N = 1847$) across 43 countries showed greater COVID related increases in both depression and anxiety among women, as compared to men (Seens et al., 2021). In another study of Canadians living in British Columbia, women reported significantly higher levels of pandemic stress, depression and anxiety, as well as increased loneliness and cannabis use as compared to men (Brotto et al., 2021). Turna et al. (2021) similarly found women reported more mental health problems, including anxiety and depression following COVID. And in a systematic review, a majority of studies worldwide reported women were at significantly higher risk for COVID related mental health problems, especially anxiety and depression (Tibubos et al., 2021). In order to test for this possibility, we included gender as a potential moderator in examining the effects of COVID stress on anxiety and depression, with the following more general hypothesis:

Hypothesis 3. Gender is a significant moderator in the relation between COVID stress and depression / anxiety.

Finally, we explore the possibility that age may function as a moderator of any COVID-related stress effects on depression/anxiety. Previous studies have noted a relationship between age and depression (Mirowsky and Ross, 1992; Rodda et al., 2011). A recent review also identified higher prevalence of anxiety symptoms in older adults, especially during the COVID pandemic (Kan et al., 2021). This leads to a final hypothesis:

Hypothesis 4. Age is a significant moderator in the relation between COVID-related stress and depression/anxiety.

The proposed moderation model is shown in Fig. 1s (supplemental materials).

2. Methods

Using Amazon Mechanical Turk (MTurk), an online crowd sourcing/research panel (Mortensen and Hughes, 2018), a sample of $N = 394$ respondents met inclusion criteria and completed a web-based survey on Survey Gizmo. The survey contained measures of hardiness, anxiety, depression, and a variety of demographics. Respondents were included if they (1) lived in Canada; (2) were 18 years of age or older; (3) spoke English; and (4) completed informed consent. Further, automatic quotas were built into the survey program such that the final sample would contain approximately equal numbers of male and female respondents, as well as balanced age groups of younger (18–44 years) and older (45+ years) people.

As a further step to assure data quality, cases were excluded that met two or more of the following conditions: 1) extremely short (less than 5 min) time taken to complete survey; 2) extremely long (greater than 40 min) time taken to complete survey; 3) giving a long consecutive string of the same response to survey questions (spurious responding); 4) large summed absolute differences (greater than 2 standard deviations above the mean) between positive and negative worded items on a scale (inconsistent responding); and 5) being identified as a multivariate outlier as assessed via Mahalanobis Distance (Ghorbani, 2019). Also excluded were four cases with missing data on the hardiness scale, which was the main focus of the study. These data-screening steps resulted in the dropping of 31 cases, leaving a final sample of 363 participants.

2.1. Measures

COVID stress was measured with a scale specially created for this study. Items inquired as to the impact (positive or negative) the COVID-19 pandemic is having in eight life domains: job/employment stability, work performance, family relationships, relationships with friends, financial situation, physical health, mental health, and education. Responses were on a 5-point scale ranging from 1 (big positive impact) to 5 (big negative impact). Item responses were summed to create a total COVID stress scale. Coefficient alpha (Cronbach, 1951) for the scale in the present sample is 0.80. The full scale is presented in Table 1, supplemental material.

Hardiness was measured with the Hardiness Resilience Gauge, or HRG (Bartone, 2018; Bartone et al., 2022). The HRG is a 28-item scale that measures total hardiness as well as the three hardiness facets of commitment, control and challenge, with items rated on a four-point Likert scale (1 = Not at all true, 4 = Completely true). Scores for hardiness were calculated by summing items within sub-scales, transforming these to standardized scores ($M = 100$ and $SD = 10$, based on the normative sample [$N = 1873$]; Bartone, 2018), and then summing and re-standardizing the scores. Reported Cronbach's alpha reliability coefficients are high, at 0.93 for total hardiness, and 0.85, 0.84 and 0.89 for commitment, control and challenge respectively (Bartone et al., 2022). Sample items are "I look forward to my daily activities" (commitment), "I am responsible for my own success in life" (control), and "I find the positives in any life change" (challenge). In the present sample, Cronbach's alpha coefficients were 0.94 for total hardiness, and 0.89 (commitment), 0.88 (control), and 0.84 (challenge).

Anxiety symptoms were measured with the GAD-7, with the seven items being measured on a four-point Likert-scale (0 = Not at all, 3 = Nearly every day; Spitzer et al., 2006). The authors report a coefficient alpha of 0.92 and test-retest reliability of 0.83 for this scale. In the present sample, Cronbach's alpha for the GAD-7 was 0.94.

Depression symptoms were measured with the nine-item PHQ-9 scale (four-point Likert scale ranging from 0 = Not at all, 3 = Nearly every day; Kroenke et al., 2001). The authors report Cronbach's alpha ranging from 0.86 to 0.89. In the present sample, Cronbach's alpha for the PHQ-9 was 0.92.

Table 1
Means, standard deviations, and correlations among the study variables.

	Mean (SD) N	COVID Stress ($\alpha = 0.80$)	Hardiness ($\alpha = 0.94$)	Gender	Age	Anxiety ($\alpha = 0.94$)	Depression ($\alpha = 0.92$)
COVID Stress (range 8–40)	27.07 (4.58) 352	1.00					
Hardiness (range 54–135)	97.16 (16.27) 363	−0.274***	1.00				
Gender	1.51 (0.52) 363	−0.12*	−0.002	1.00			
Age	48.78 (15.27) 363	−0.07	0.005	0.081	1.00		
Anxiety (range 0–21)	4.81 (5.35) 357	0.287***	−0.384***	−0.065	−0.315***	1.00	
Depression (range 0–27)	6.01 (6.10) 362	0.312***	−0.382***	−0.036	−0.354***	0.829***	1.00

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; Two-tailed significance tests. Gender: 1 = male; 2 = female.

2.2. Data analysis

Pearson correlations were computed to assess the first-order relations among the study variables. Next, we conducted path analysis using ordinary least squares (OLS) regression with Hayes (2018) PROCESS procedure for SPSS. With PROCESS, we evaluated the effects of COVID-related stress on anxiety and depression scores, as well as the possible moderating influence of gender and age on these relations. The PROCESS regression approach generates bootstrap confidence intervals that represent the sampling distribution for conditional effects in moderation models. Bootstrap confidence intervals yield inferences of indirect and conditional effects that are less influenced by sampling distribution irregularities than are traditional tests based on normal theory (Hayes, 2018). To test for effects of hardiness, gender, and age, we evaluated simple moderation models (Hayes model 1) in which anxiety and depression scores were regressed on COVID-related stress, and considered hardiness, gender, and age as potential moderators. In our analyses, we used 5000 bootstrapped samples to generate 95 % confidence intervals. These confidence intervals were then used to evaluate the null hypotheses. All predictors were mean-centered in order to simplify interpretation of observed effects (Hayes, 2018).

3. Results

A total of 363 respondents comprised the sample, with 50.1 % identified as male, and 49.6 % identified as female (one person selected “prefer not to say”). The mean age was 48.8 years old (Standard Deviation [S.D.] = 15.3). The race/ethnicity breakdown was 69.7 % White, 21.4 % Asian, 2.8 % Black, and 6.1 % Other. In terms of education, 20.1 % were high school graduates, 35.4 % had completed some college, 32 % held Bachelor's degrees, and 9.9 % completed professional or graduate school. As to work status, 63.4 % were employed full- or part-time, 24 % were retired, and 10.2 % were unemployed.

Correlations among the study variables are shown in Table 1. As can be seen, anxiety and depression are positively related to COVID stress, while hardiness correlates negatively with anxiety, depression, and COVID-related stress (all $p < .001$). Age is significantly correlated with both anxiety ($r = -0.31, p < .001$) and depression ($r = -0.35, p < .001$), indicating that younger people are experiencing more anxiety and depression compared to older people in this sample. The only correlation seen with gender is COVID-related stress, with women reporting slightly more COVID-related stress ($r = -0.12, p < .05$).

To further clarify the COVID stress variable, Fig. 1 displays the

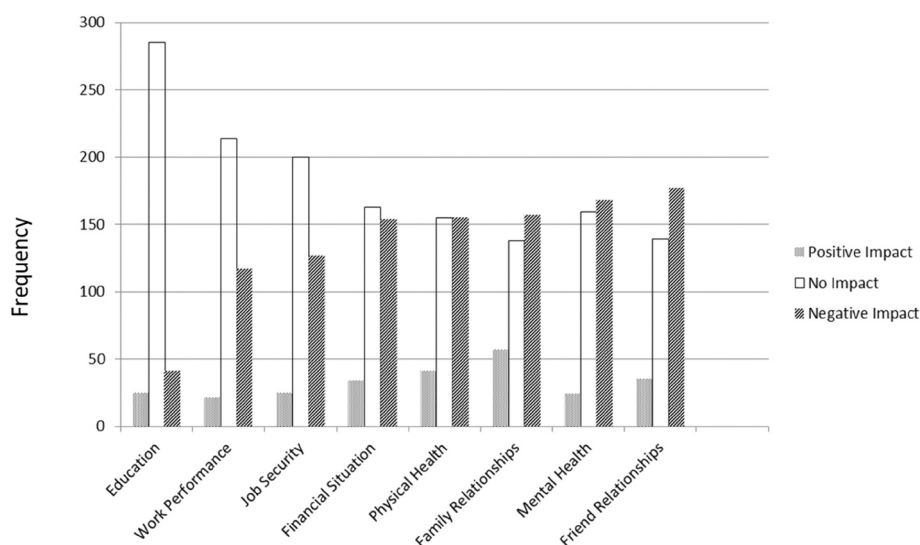


Fig. 1. Impact of COVID Stress on different life domains (N = 351).

distributions for the eight individual items. The biggest negative impact (right side of chart) was reported regarding relationships with friends and family, one's own mental and physical health, and one's financial situation. Minimal impact was seen on education activities.

Following up on the correlation of gender with COVID stress, we conducted independent sample *t*-tests comparing the means for men and women on each of the stress items as well as total scores. Results revealed women experienced greater COVID related stress than men overall ($p < .01$), and particularly in the areas of finances ($p < .01$), job stability ($p < .01$), and work performance ($p < .05$). There were no gender differences in terms of social and family relationships, mental health, or physical health. The *t*-tests also revealed no differences between men and women in anxiety, depression, or hardiness.

Next, OLS regressions examined the association of COVID stress with anxiety and depression, with hardiness as a moderator and age and gender entered as covariates. Results (Table 2) were similar for both anxiety and depression. COVID stress was a highly significant predictor of anxiety ($p < .001$) and depression ($p < .001$) providing support for hypothesis 1 and 2. Hardiness also emerged as a significant moderator for both ($p < .001$), lending support to hypothesis 1a and 2a. Age was also a significant predictor of anxiety and depression, showing a slightly stronger relation to depression. Gender showed no direct relation to anxiety or depression in any of the models tested. When entered separately as a moderator, the COVID stress*gender interaction likewise was not significant.

To further understand the moderator effect of hardiness on anxiety and depression, the interaction was probed using the PLOT procedure under the PROCESS macro (Hayes, 2018). Results for anxiety are shown in Fig. 2 and for depression in Fig. 3. The three lines represent hardiness scores at the mean, and one standard deviation above and below this point. Results indicate that those low in hardiness (top line) start out at higher levels of anxiety and depression, and show steeper increases as COVID stress intensifies.

The next set of regressions assessed hardiness and age simultaneously as moderators of the COVID stress effect first on anxiety, and then on depression. Here, hardiness again emerged as a significant moderator for both anxiety and depression ($p < .001$). Age was also a moderator, but only with respect to depression ($p < .05$). Here, the R^2 change for both interaction effects was significant, with $\Delta R^2 = 0.021$ for COVID stress X hardiness ($p < .001$), and $\Delta R^2 = 0.008$ for COVID stress X age ($p = .04$). The overall model was highly significant, $F(6,345) = 27.46, p < .001$, with an $R^2 = 0.32$. Table 3 provides the detailed results for this regression model.

Again, the interactions were probed using the PLOT procedure under the PROCESS macro (Hayes, 2018). Results for two age categories are shown in Fig. 4 with the younger on top and older on bottom. As before, the three lines represent hardiness scores at the mean, and one standard deviation above and below this point. Results again show steeper increases in depression among those low in hardiness as COVID stress intensifies, and this is true across age groups. Depression levels are overall highest in the younger age group and lowest among the older group. However, the slope of the lines is greater in the older age group,

indicating a steeper rise in depression as COVID stress increases for the older age group.

4. Discussion

In a sizeable cross-section of the Canadian population, this study has shown first of all that stress factors related to the COVID pandemic are associated with substantial increases in symptoms of anxiety and depression, thus confirming hypotheses 1 and 2. Approximately half of the present sample indicates the COVID pandemic and related restrictions have had a negative impact on their social relationships with family and friends and on their physical, mental, and financial well-being. Other studies have also identified negative effects of COVID restrictions on social relationships, as well as mental and physical health (Lahav, 2020; Xiang et al., 2020). Another third of the current sample reported COVID was having a negative impact on their work performance and job security. This trend has also been found in a number of recent studies; for example, a study of Chinese workers across multiple organizations found the disruption caused by COVID led to increased feelings of job insecurity, emotional exhaustion, and disengagement from the job (Lin et al., 2021).

At the same time, we observed substantial variability in how COVID related stress was related to anxiety and depression in our sample. In particular, the impact of COVID related stress was found to be conditioned by hardiness levels. Those respondents high in hardiness showed less of an increase in anxiety and depression symptoms in relation to COVID stress. Thus, as postulated in hypotheses 1b and 2b, hardiness appears to act as a moderator or “buffer” of the ill-effects of COVID stress, lending support to these hypotheses. This finding is also in line with previous studies showing that hardiness moderates the effects of various kinds of stress on a range of health and performance outcomes (Bartone and Homish, 2020; Bartone, 1999; Eschleman et al., 2010; Kobasa, 1979a, 1979b; Maddi and Kobasa, 1984).

What is it about hardiness that may serve to lower the impact of COVID related stress on anxiety and depression? The beneficial effects of hardiness likely have to do with the appraisals or interpretations made by hardy people when they encounter novel and disruptive conditions in life. They tend to see such situations as an expected part of existence, and generally within their power to manage. Stressful encounters are construed more as challenges to be overcome, rather than threats to security (Stein and Bartone, 2020). Next, in confronting stressful and difficult situations, hardy persons prefer to use active, problem-solving coping strategies, whereas those low in hardiness rely more on avoidance coping techniques such as denial or turning to drugs and alcohol (Bartone and Homish, 2020; Thomassen et al., 2018). Thus, hardy persons first appraise stressful conditions in more positive terms, then they seek out ways to solve the problem and adapt to the new reality.

The present study also finds that gender is not a moderator in the relation of COVID stress to mental health, as indexed by anxiety and depression, thus not supporting hypothesis 3. This is initially surprising considering recent studies showing women report higher levels of anxiety and depression under COVID stress (Seens et al., 2021; Brottot et al.,

Table 2
OLS regression results of COVID stress effect on anxiety and depression, with hardiness as a moderator.

Variables	Anxiety			Depression		
	B	SE B	95 % CI	B	SE B	95 % CI
COVID Stress	0.291***	0.058	[0.18; 0.40]	0.287***	0.064	[0.16; 0.41]
Hardiness	-0.105***	0.015	[-0.13; -0.07]	-0.125***	0.017	[-0.16; -0.09]
Stress*Hardy	-0.011***	0.003	[-0.02; -0.01]	-0.012***	0.004	[-0.02; -0.01]
Age	-0.102***	0.016	[-0.13; -0.07]	-0.125***	0.018	[-0.16; -0.09]
Gender	-0.049	0.469	[-0.97; 0.87]	0.378	0.523	[-0.65; 1.41]
	$R^2 = 0.305$			$R^2 = 0.315$		
	$F(5,346) = 30.33***$			$F(5,346) = 31.87***$		

Note: B = unstandardized beta coefficient. CI = confidence interval for B. * $p < .05$. ** $p < .01$. *** $p < .001$. Age and gender are entered as covariates.

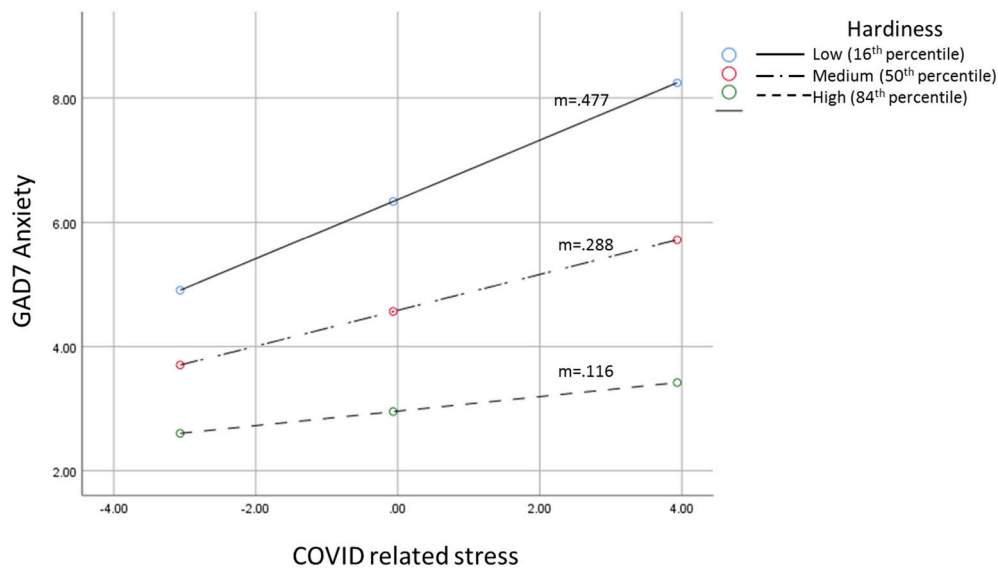


Fig. 2. Hardiness as a moderator of the COVID stress - anxiety relation.

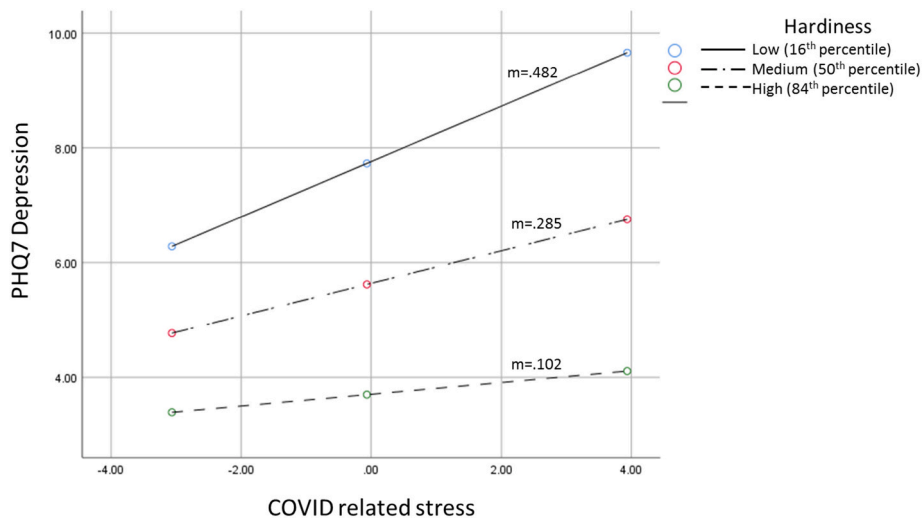


Fig. 3. Hardiness as a moderator of the COVID stress - depression relation.

Table 3

OLS regression results of COVID stress effect on anxiety and depression, with both hardiness and age as moderators.

Variables	Anxiety			Depression		
	B	SE B	95 % CI	B	SE B	95 % CI
COVID Stress	0.323***	0.063	[0.20; 0.45]	0.344***	0.069	[0.21; 0.48]
Hardiness	-0.103***	0.015	[-0.13; -0.07]	-0.122***	0.017	[-0.16; -0.09]
Stress*Hardy	-0.011***	0.003	[-0.02; -0.01]	-0.012***	0.004	[-0.02; -0.00]
Age	-0.101***	0.016	[-0.13; -0.07]	-0.123***	0.018	[-0.16; -0.09]
Stress*Age	0.005	0.004	[-0.00; 0.01]	0.009*	0.004	[0.00; 0.02]
Gender	0.027	0.473	[-0.90; 0.96]	0.515	0.525	[-0.52; 1.55]
	$R^2 = 0.309$			$R^2 = 0.323$		
	$F(6,345) = 25.57***$			$F(6,345) = 27.46***$		

Note: B = unstandardized beta coefficient. CI = confidence interval for B. * $p < .05$. ** $p < .01$. *** $p < .001$. Gender is entered as a covariate.

2021). However, these studies also show that women are experiencing higher levels of COVID related stress compared to men. The present study shows that the association between COVID stress and mental health (anxiety and depression) is not conditional based on gender (moderation). So it is not the case that women are reacting more negatively than men to the same levels of COVID stress, but rather that

they are reacting to higher levels of COVID stress. So our findings are not inconsistent with previous research in this area, but suggest the reason women report more anxiety and depression related to COVID is not that they are somehow more vulnerable, but rather that they are actually experiencing greater stress and reacting normally to it.

In the present study women do report significantly more COVID

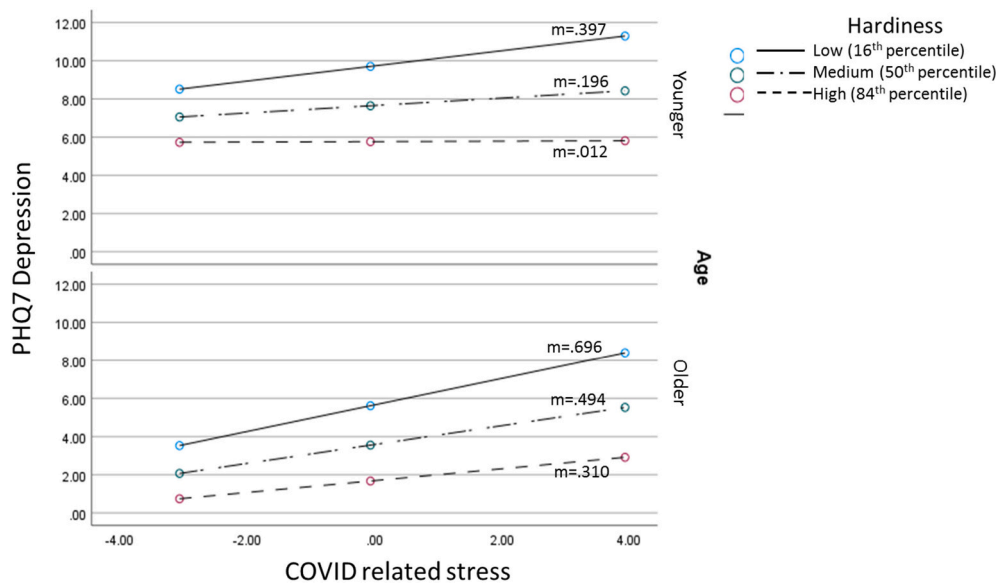


Fig. 4. Hardiness and age as moderators of the COVID stress - depression relation.

related stress than men, particularly in the domains of work performance, job stability, and finances. This finding is likely a function of working women having greater responsibility for childcare and domestic maintenance under COVID restrictions that may require them to work remotely, where children are also at home due to closure of schools and childcare facilities. In this context, some working women have also assumed responsibility for home-schooling of children. Many have also been forced to leave their jobs due to COVID. For example, the 2020 Kaiser Family Foundation Women's Health Survey found that 47 % of U. S. working mothers were forced to take unpaid sick leave in 2020 because schools and day care centers were closed (Ranji et al., 2021). That survey also found that COVID was having a substantial effect on working mothers' ability to meet their work obligations, with 10 % of those surveyed having quit their jobs due to COVID. Another report by the McKinsey consulting firm similarly finds that women are more likely than men to have been laid off or furloughed during the COVID pandemic, and they report higher levels of burnout and anxiety over job security (Thomas et al., 2020). In a large-scale study of 6795 working parents in the United Kingdom Household Longitudinal Study, it was found that COVID-19 has significantly greater impact on the financial security of women, and that working mothers experience greater strain, worry, and sleep loss (Cheng et al., 2021). In line with this previous research, the present study also finds that COVID is having a somewhat greater impact on women, particularly in terms of reducing financial and job security.

Our results identified significant age effects, with older respondents reporting less anxiety and depression, and younger ones more. Additionally, age emerged as a moderator in the COVID stress - depression relation (providing support for Hypothesis 4), along with the moderator of hardiness. As shown in the upper portion of Fig. 4, younger respondents report more depression symptoms overall, with the most depression among those low in hardiness and high in COVID related stress. However, the lower portion of Fig. 4 shows a somewhat steeper upward curve for older respondents as COVID stress increases, an increase that appears greatest for those low in hardiness. Thus, although the older group starts out overall lower than the young in depression, COVID stress appears to have a greater impact on their depression symptoms.

The finding that depression is lower overall among the older respondents in our sample coincides with other studies that have found lower depression in older adults. For example, in their review, Fiske et al. (2009) report that depression is less prevalent in older adults

compared to younger ones. They attribute this trend to several factors, including that older people often have better socioeconomic resources, and that life experiences have taught them coping strategies and ways to access social support that help them to manage stressful encounters (Hendrie et al., 2006). Older adults are also typically less reactive to stress, especially around interpersonal issues, compared to young adults (Neupert et al., 2007).

Since this was a cross-sectional study, it is possible that cohort or generational historical factors may account for observed age differences (Schaie, 2000). For example, younger generations could be more vulnerable to stress-related mental health problems in part due to having grown up in overprotected social environments. Yet another possibility is a survivor effect, in which older people are lower in depression because people high in depression experience early mortality, whereas surviving older people are more adaptable and experienced in managing life's ups and downs. Future longitudinal studies are needed to assess these various possibilities.

As to the increasing rate of impact COVID stress has on older respondents, the most obvious explanation is that the older people are more vulnerable to become infected with the COVID virus, and therefore more likely to experience serious illness and death as a result. Older individuals tend to have more pre-existing health conditions, and often less robust immune systems compared to the young, further increasing their risk. Likewise, they have been subjected to numerous public health messages about the increased risk for older age groups, urging them to take extensive safety precautions and get vaccinated. Thus, it is understandable that older people may be more cautious regarding COVID and more sensitive to the range of COVID-related stressors.

4.1. Limitations and future research

This study has several limitations that should be noted. The present findings are based on a sample of the Canadian general population and therefore may not necessarily be generalizable to other countries. However, the sample was carefully drawn to include a broad cross-section of the Canadian population, including equal numbers of men and women and a wide range of ages and ethnicities. It is nevertheless important to confirm the present findings in other nations and cultures. Also, the design was cross-sectional, with all data collected at a single point in time. This means that no definitive conclusions can be drawn regarding the directionality of effects. It would be desirable to collect mental health outcome measures at a later point in time than COVID

stress and hardiness. Nevertheless, it is now fairly well established that hardiness is an individual trait-like quality that remains fairly stable over time (Bartone, 2007; Hystad et al., 2015). Thus it is reasonable to consider hardiness as a moderator in modeling the effects of COVID stress on mental health. It would still be desirable to measure mental health outcomes later in time, following exposure to COVID stress.

It should also be noted that the GAD and PHQ are self-reported questionnaires of symptoms but do not measure the full criteria of clinical diagnosis for these mental health conditions. Although high scores on these measures are associated with a clinical diagnosis of anxiety and depression, respectively, the results are not meant to be understood as an official diagnosis.

The present results showing personality hardiness as a moderator in the COVID stress – depression and anxiety relation raise the question as to what other personality factors might play a similar role. Woon et al. (2020) for example have shown that certain of the Big Five factors are predictive of depression and anxiety in Malaysian diabetes patients. Future studies in this area may wish to consider the Big Five factors as potential moderators of COVID stress on mental health outcomes such as depression and anxiety.

While hardiness has been shown to be an important personal resource contributing to resilient outcomes in the face of COVID stress, other factors can also influence resilience. For example, multiple studies have shown that social support often adds to resilience along with hardiness (Atri et al., 2007; Kobasa et al., 1985; Weiss, 2002). In a study following the first wave of COVID in 2019, Woon et al. (2021) found that social support was a predictor of less depression and anxiety in a sample of 316 Malaysian university students. It would thus make sense for future studies to include social support as a potential moderator of COVID stress effects on mental health.

Finally, the present work relies on a crowdsourcing (MTurk) and online survey platform (Survey Gizmo). These platforms have become quite common in social science research, and although some research has found MTurk samples can be less representative of the general population (Ophir et al., 2020; Paolacci and Chandler, 2014), these limitations can be overcome by using careful screening methods, such as recruiting a balanced sample or matching demographic information to census data. In the current study we recruited an even number of participants from both gender groups and along two age divisions. In addition, there was variance in racial/ethnic groups, education level and employment status. Further, a number of data screening metrics were used to screen for poor data quality (i.e., acquiescence, excessively inconsistent or repetitive responding, etc), which has advocated when using such platforms (Fleischer et al., 2015). Thus, we have greater confidence in the representativeness of the sample and quality of the data.

4.2. Conclusions and implications

In a sample of the Canadian population, this study finds that hardiness exerts a protective effect against COVID related stress, and also that sex does not moderate the effects of COVID stress on anxiety or depression. Age or experience also appears to provide some resistance against COVID related stress, as older people generally show lower levels of anxiety and depression through the COVID period compared to the younger adult population. The caveat to this is that older people appear to react more strongly to COVID stress, experiencing steeper increases in depression symptoms as COVID stress mounts.

These results carry practical implications for how to reduce or mitigate the negative mental health consequences of COVID related stress. First, at-risk groups may benefit from special training aimed at enhancing hardiness attitudes and coping skills (Bartone et al., 2016; Judkins et al., 2006). In addition, supervisors and leaders can promote hardiness among working adults through their personal example in role-modeling positive coping strategies during stressful conditions and by the workplace policies they establish and uphold. For example, by

allowing workers to have greater control over their tasks and schedules, and providing recognition for a job well done, leaders reinforce the key hardiness elements of control and commitment (Bartone, 2017). In the COVID environment where more people are teleworking and face-to-face contact with co-workers is minimal, it may be easy for supervisors to lose touch with their workers and fail to provide recognition and support, leading to increased alienation and vulnerability to mental health problems.

To the extent that fewer anxiety and depression symptoms among adults reflects their greater experience and abilities to cope with stressors such as those brought on by the COVID pandemic, direct interventions aimed at increasing these coping skills should prove beneficial to younger people as well. The coping skills strategies used by high hardy people are fairly well known and can be fruitfully applied across multiple stressful situations (Bartone and Hystad, 2010; Stein and Bartone, 2020). At the same time, hardiness skills training programs that are customized to particular groups are likely to be more effective and better accepted. For example, health care workers have been especially hard hit by COVID related stress. According to a recent survey by the American Medical Association, 49 % report symptoms of burnout, and 38 % have experienced increased anxiety and depression (Berg, 2021; Prasad et al., 2021). Hardiness skills training for health care workers could include the presentation and discussion of hospital situations that medical workers typically confront, with examples of coping approaches that emphasize personal control, appraisal of stressful situations as challenges to overcome and learn from, and reminders of the overall importance and meaning (hardiness commitment) of the work being accomplished. In fact, the nursing community has already developed some trial programs along these lines (Judkins et al., 2006; Tierney and Lavelle, 1997). Future research should aim to refine such hardiness training programs and adapt them to other groups at high risk for COVID stress related mental health problems.

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CRedit authorship contribution statement

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Conflict of Interest

None to declare.

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