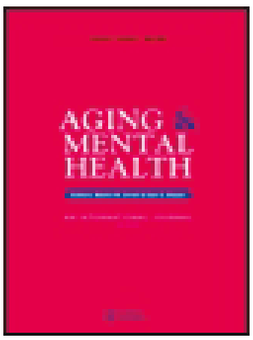

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COVID-19 worries and mental health: the moderating effect of age

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ABSTRACT

Background: Older age (60+ years) increases the risk of contracting and dying from coronavirus disease 2019 (COVID-19), which might suggest worse mental health for those in this age range during the pandemic. Indeed, greater worry about COVID-19 is associated with poorer mental health. However, older age is generally associated with better emotional well-being, despite increased likelihood of negative events (e.g. death of a spouse) with age. This study examined whether age moderated the relation between COVID-19 worries and mental health.

Methods: A national sample of U.S. adults ($N = 848$; aged 18–85 years) completed an online survey from March 30 to April 5, 2020. The survey assessed anxiety, depression, general concern about COVID-19, perceived likelihood of contracting COVID-19, social distancing, self-quarantining, current mood, health, and demographics.

Results: Older age was associated with better mental health (i.e. lower levels of anxiety and depression). Greater perceived likelihood of contracting COVID-19 was related to higher anxiety. However, this effect was moderated by age. At younger ages (18–49 years), the positive association between perceived likelihood of contracting COVID-19 and anxiety was significant, but the association was not significant at older ages (50+ years).

Conclusion: Older age may buffer against the negative impact of the COVID-19 pandemic on mental health. More research is necessary to understand the potential protective nature of age during the pandemic, as well as the recovery period.

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KEYWORDS
Anxiety; depression; COVID-19; well-being paradox

The coronavirus disease 2019 (COVID-19) pandemic has significantly impacted mental health across the globe (Rajkumar, 2020; Torales, O'Higgins, Castaldelli-Maia, & Ventriglio, 2020). In the United States, one study found that 44% of Americans in 'good to excellent' health and 53% in 'fair to poor health' reported that worry about COVID-19 has had a negative impact on their mental health (Panchal et al., 2020). Similarly, in a national survey, 33% of Americans reported psychological distress (e.g. anxiety and depression) during the pandemic (Pew Research Center, 2020). Some evidence suggests that individuals who are more concerned about, or likely to contract, COVID-19 report higher levels of anxiety and depression (Centers for Disease Control and Prevention, 2020a; Huang & Zhao, 2020), potentially due to heightened worry about the disease. However, this may not be true of all at-risk groups. Older adults (60+ years) are at higher risk of contracting and dying from COVID-19 (Centers for Disease Control and Prevention, 2020a; WHO, 2020), but older age is generally associated with lower levels of anxiety and depression (e.g. Löwe et al., 2010). Moreover, scholars have referred to a 'well-being paradox' in older age (Baltes & Baltes, 1990). That is, despite the increased likelihood of negative events with aging, such as greater risk of illness, older adults generally report better emotional well-being than younger adults. Thus, the goal of the present research was to test whether age moderated the association between COVID-19 worries and mental health, such that older age may buffer against the negative relation between COVID-19 worries and anxiety or depression.

A growing body of evidence indicates that on average those older in age report better emotional well-being than those younger in age, despite experiencing relatively more losses than gains (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Carstensen, Fung, & Charles, 2003). For example, older adults tend to report greater life satisfaction and positive affect, as well as less negative affect than younger adults (Carstensen et al., 2000; Mroczek & Kolarz, 1998; Mroczek & Spiro, 2005; Shook, Ford, Strough, Delaney, & Barker, 2017; Stone, Schwartz, Broderick, & Deaton, 2010). According to socioemotional selectivity theory (Carstensen, Fung, & Charles, 2003), these age differences in emotional well-being stem from changes in time perspective across adulthood. Specifically, when younger in age, individuals generally believe they have a great deal of time ahead of them and pursue more long-term, knowledge-related goals. Younger adults then are more future oriented and perceive an expansive time perspective (Carstensen, 2006). With increasing age, individuals become more aware of life's finitude and may develop a sense of time running out. Those older in age are thought to perceive a more limited time perspective, which motivates a shift towards the present moment, or the 'here and now' (Carstensen, 2006). With this change in time perspective, goals are also proposed to shift across adulthood, moving from knowledge-based goals in younger age to emotional goals in older age. Focusing on the present moment, older

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adults are more likely to pursue short-term goals related to maximizing positive experiences and avoiding negative experiences. Thus, older adults regulate their emotional experiences, increasing pleasurable emotions and decreasing unpleasant emotions (Carstensen, 2006; Mather, 2012).

Older adults' capacity to regulate their emotions aids in their ability to better manage stress compared to younger adults. Those older in age tend to report being less emotionally reactive and experience less negative affect after stressful events relative to those younger in age (Schilling & Diehl, 2014). For example, Brose, Schmiedek, Lövdén, and Lindenberger (2011) showed that older adults reported less intrusive thoughts and negative affect in reaction to daily stressors relative to younger adults. Older adults also tend to report perceiving stressful events as less unpleasant (Neubauer et al., 2019) and are able to maintain stable levels of positive affect compared to younger adults (Charles, Mogle, Urban, & Almeida, 2016). Multiple sources of stress have stemmed from the COVID-19 pandemic, such as the immediate health threat, job insecurity, financial concerns, and changes to social routines (Park et al., 2020; Wilson et al., 2020). Although there are undoubtedly individual differences in the extent to which each stressor may impact people, theory and empirical evidence suggest that older adults may be better able to cope with these stressors than younger adults. Thus, COVID-19 worries may be less related to mental health for those older in age.

Initial evidence indicates that older age is associated with lower levels of anxiety and depression during the COVID-19 pandemic (Bruine de Bruin, 2020; Huang & Zhao, 2020). However, it is unclear whether age specifically buffers the negative association between COVID-19 worry and mental health, or whether the recently reported age differences in mental health during the pandemic simply reflect preexisting differences. Additionally, prior work did not control for the high comorbidity between anxiety and depression (Brown, Chorpita, & Barlow, 1998; Cummings, Caporino, & Kendall, 2014) in analyses. Accounting for comorbidity allows for greater insight into the extent to which specific factors are related to anxiety independent of overlapping depressive symptomatology, and vice versa (Hinden, Compas, Howell, & Achenbach, 1997). For example, it is unclear whether the finding that older age is associated with lower levels of anxiety during the pandemic (Bruine de Bruin, 2020) is a true association, or if it emerged as a result of a correlation between age and depression. Also, age differences in mental health during the pandemic may be due to differential engagement in COVID-19 preventative health behaviors (e.g. social distancing or self-quarantining). One study showed that older adults reported greater engagement in social distancing than younger adults, but found no age differences in self-quarantining (Barber & Kim, 2020). Because social distancing and self-quarantining are recommended practices to reduce and slow the spread of COVID-19 (Centers for Disease Control and Prevention, 2020a), greater engagement in these behaviors may be associated with better mental health in older ages due to decreased likelihood of exposure to the disease.

The present study tested whether age moderated the association between COVID-19 worries (i.e. general concern about COVID-19 and perceived likelihood of contracting COVID-19) and mental health (i.e. anxiety and depression). Engagement in social distancing, self-quarantining, current mood, health, and demographics were included as covariates to isolate the unique effects of age and COVID-19 worries on mental health. Based on previous research, we expected COVID-19 worries to be associated with worse mental health, and older age to be associated with better mental health. Further, based on the 'well-being paradox' and socioemotional selectivity theory, we expected the association between COVID-19 worries and mental health to be weaker in older age and stronger in younger age.

Method

Participants and procedure

Data were collected from a nationally representative sample of U.S. residents ($N = 901$) from March 30 to April 5, 2020. Participants were recruited through the panel provider Qualtrics for a larger longitudinal study about the effects of COVID-19. Fifty-three participants were excluded for problematic response patterns (e.g. nonsensical open-ended responses, straight line responses to close-ended measures; $n = 11$) or not reporting their age ($n = 42$). The final sample was still nationally representative and included 848 participants aged 18–85 years ($M_{age} = 48.02$, $SD = 16.30$; 51.2% female; 78.8% White; Mdn_{income} = $70,000–$79,999).[1] Age was relatively evenly distributed across adulthood. There were 324 young adult respondents aged 18–39 years ($M_{age} = 31.17$, $SD = 5.24$); 261 middle-aged adult respondents aged 40–59 years ($M_{age} = 48.45$, $SD = 5.72$); and 263 older adult respondents aged 60+ years ($M_{age} = 68.35$, $SD = 5.16$). A power analysis indicated that a sample of 418 was sufficient to detect a small effect (.05), assuming power is .80 and $\alpha = .05$.

After providing electronic consent, participants completed study measures and other questionnaires in a random order, except for health items which appeared last. The online survey took approximately 35 min, and participants were given monetary compensation in an amount established by the panel provider. Demographic information was collected from a previous wave (see Table 1).

Measures

COVID-19 worries

General concern about COVID-19 was assessed by asking 'How concerned are you about the coronavirus, COVID-19?' from 1 (*not at all concerned*) to 5 (*very concerned*). Perceived likelihood of contracting COVID-19 was assessed by asking 'How likely do you think you are to contract the coronavirus, COVID-19?' from 1 (*not at all*) to 5 (*extremely likely*).

Mental health

The 7-item General Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006) assessed anxiety. Participants indicated the extent to which they had experienced anxiety symptoms (e.g. 'feeling nervous, anxious, or on edge') over the past week on a scale from 0 (*not at all*) to 3 (*nearly every day*). Standard GAD-7 instructions ask participants to report on their symptoms over the past two

weeks. We adapted the instructions to ask about symptoms over the past week, as the larger longitudinal study consisted of weekly surveys. A composite score was created by summing all items. Higher scores indicated higher anxiety ($\alpha = .95$). Per the standard scoring for the GAD-7 (Spitzer et al., 2006), scores ranging from 0 to 4 are considered to be 'Minimal or none' anxiety symptoms; 5 to 9 are considered to be 'Mild' anxiety symptoms; 10 to 14 are considered to be 'Moderate' anxiety symptoms; and 15 or greater are considered to be 'Severe' anxiety symptoms.

An abbreviated 8-item version of the Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) assessed depression. Participants indicated the extent to which they had experienced depressive symptoms (e.g. 'little interest or pleasure in doing things') over the past week on a scale from 0 (*not at all*) to 3 (*nearly every day*). Standard PHQ-9 instructions ask participants to report on their symptoms over the past two weeks. Again, we adapted the instructions to ask about symptoms over the past week, as the larger longitudinal study consisted of weekly surveys. The original PHQ-9 includes a single item asking about suicidal ideation, which was excluded from the survey that participants received. Research shows that excluding the item on suicidal ideation has only a minor effect on scoring, because it is the least frequently endorsed item on the scale and on average contributes only a point or two to the overall PHQ score (Kroenke, Spitzer, Williams, & Löwe, 2010; Kroenke & Spitzer, 2002). A composite score was created by summing all items. Higher scores indicated greater depression ($\alpha = .94$). Per the standard scoring for the PHQ-9 (Kroenke et al., 2001), scores ranging from 0 to 4 are considered to be 'Minimal or none' depressive symptoms; 5 to 9 are considered to be 'Mild' depressive symptoms; 10 to 14 are considered to be 'Moderate' depressive symptoms; 15 to 19 are considered to be 'Moderately severe' depressive symptoms; and 20 to 27 are considered to be 'Severe' depressive symptoms.

Table 1. Demographic characteristics of the sample ($N = 848$).

Demographic variables	*N*	%
Age		
18–39 years	324	38.2%
40–59years	261	30.8%
60+ years	263	31%
Sex		
Female	434	51.2%
Male	412	48.6%
Not reported	2	0.2%
Race/Ethnicity		
White	668	78.8%
Latino(a)	48	5.7%
Black	46	5.4%
Asian	68	8%
Native Am.	11	1.3%
Other	4	0.5%
Not reported	3	0.4%
Income		
<$20,000	53	6.2%
$20,000–$39,000	115	13.5%
$40,000–$59,000	148	17.5%
$60,000–$79,000	149	17.6%
$80,000–$99,000	101	11.9%
$100,000–$149,999	169	19.9%
>$150,000	113	13.3%
Education		
Less than/some high school	9	1.1%
GED/high school equivalency	16	1.9%
High school graduate	90	10.6%
Vocation/trade school	22	2.6%
Some college	125	14.7%
Associate's degree	69	8.1%
College graduate	298	35.1%
Graduate studies/professional degree	218	25.7%
Not reported	1	0.1%
Relationship status		
Single	216	25.5%
In a committed relationship	77	9.1%
Married	478	56.4%
Separated	5	0.6%
Divorced	45	5.3%
Widowed	25	2.9%
Not reported	2	0.2%

Covariates

Participants were asked 'In the past week, to what extent have you engaged in social distancing (i.e. reducing contact with others to avoid contracting COVID-19)?' from 1 (*not at all*) to 5 (*a great deal*). Participants were asked to indicate whether or not ('yes' or 'no') they self-quarantined (i.e. stay at home to avoid contracting or spreading COVID-19) over the past week. Those who indicated 'yes' then indicated the number of days (i.e. 1–7 days) they self-quarantined. Those who answered 'no' were scored as 0 days. Participants were asked 'How positive are you feeling right now?' and 'How negative are you feeling right now?' from 1 (*not very*) to 7 (*very*) to control for potential mood effects. General health was assessed on a scale from 1 (*poor*) to 5 (*excellent*). Recent illness was assessed using four items (e.g. 'Over the past couple days, I have not been feeling well'; Miller & Maner, 2011) on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Scores were averaged and higher scores indicated more recent illness ($\alpha = .93$). Participants indicated COVID-19 infection status based on whether they thought they currently have or previously

Table 2. Means, standard deviations, and bivariate correlations among key study variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxiety	–											
2. Depression	.79***	–										
3. Concern about COVID-19	.19***	.13***	–									
4. Likelihood of contracting COVID-19	.30***	.30***	.22***	–								
5. Age	–.29***	–.35***	.11**	–.15***	–							
6. Perceived social distancing	.07	.02	.49***	.09**	.15***	–						
7. Self-quarantining	.08*	.05	.19***	.04	–.02	.26***	–					
8. Positive mood	–.36***	–.25***	–.17***	–.03	–.02	–.10**	–.01	–				
9. Negative mood	.51***	.47***	.22***	.22***	–.06	.08*	.05	–.63***	–			
10. Illness recency	.48***	.58***	.03	.38***	–.29***	–.10**	.003	–.01	.29***	–		
11. General health	–.19***	–.20***	–.03	–.12**	–.05	.07	.01	.30***	–.20***	–.20***	–	
12. COVID-19 infection status	.27***	.31***	.06	.33***	–.23***	–.03	–.01	–.05	.21***	.39***	.02	–
Mean	5.33	5.38	4.31	2.33	48.02	4.43	4.71	4.43	3.60	2.16	3.58	0.21
SD	5.82	6.10	0.91	1.01	16.30	0.93	2.85	1.57	1.73	1.54	0.90	0.40

Notes. COVID-19 infection status (1 = yes/maybe, 0 = no). *$p < .05$, **$p < .01$, ***$p < .001$.

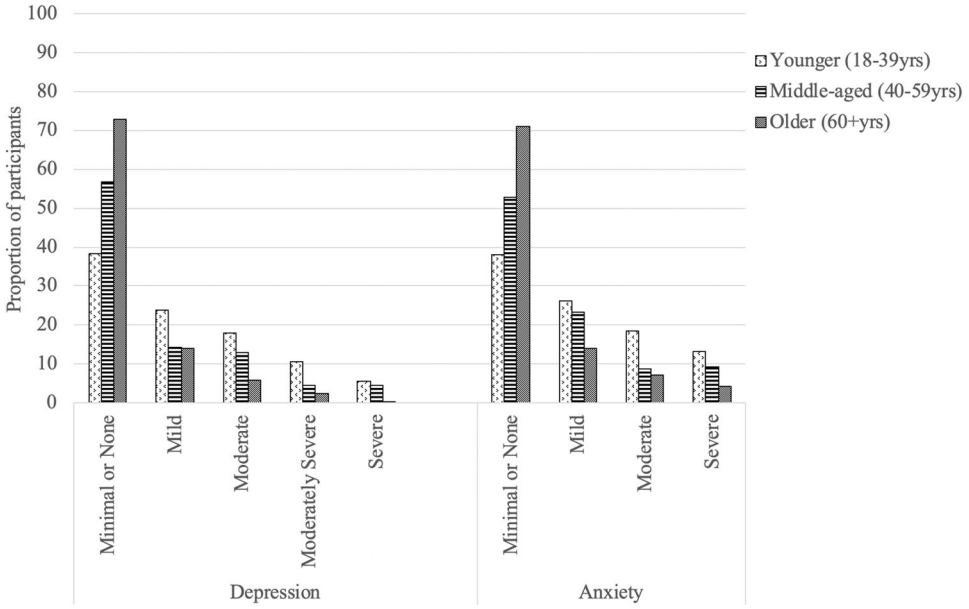

Figure 1. Distribution of anxiety and depressive symptoms split by age group.

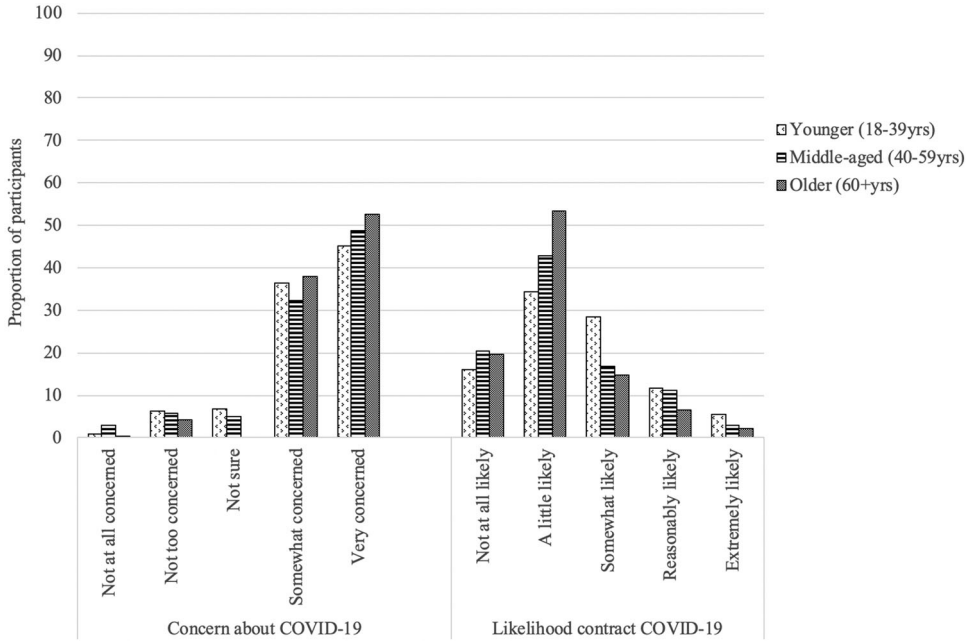

Figure 2. Distribution of COVID-19 worry variables split by age group.

had COVID-19 with response options, 'yes', 'maybe', or 'no'. Responses were dichotomized (0 = no; 1 = yes/maybe).[2] Demographics included age, education, income, race, sex, and relationship status.

Results

Descriptive statistics

Means and standard deviations for the primary study variables are presented in Table 1. Based on established categories of anxiety, 55.2% of the sample reported 'minimal to none' anxiety symptoms, 22.6% reported 'mild' anxiety symptoms, 12.6% reported 'moderate' anxiety symptoms, and 9.5% reported 'severe' anxiety symptoms. Based on established categories of depression, 57.6% reported 'minimal to none' depressive symptoms, 18.7% reported 'mild' depressive symptoms, 13.2% reported 'moderate' depressive symptoms, 6.5% reported 'moderately severe' depressive symptoms, and 3.8% reported 'severe' depressive symptoms (see Figure 1 for distribution of anxiety and depressive symptoms split by age group). The majority of participants (88.5%) reported some level of concern about COVID-19, with 37.5% somewhat concerned and 51% very concerned. Most participants (80.5%) reported some perception of being likely to contract COVID-19, with 45.1% indicating a little likely, 21.7% indicating somewhat likely, 10.4% indicating reasonably likely, and 3.2% indicating extremely likely (see Figure 2 for distribution of COVID-19 worry variables split by age group). Additionally, the majority of participants (97.9%) reported engaging in some degree of social distancing, with 2.5% indicating a little, 10.7% indicating somewhat, 19.6% indicating a lot, and 65.1% indicating a great deal. Most participants (78.6%)

Table 3. Multiple regressions predicting anxiety and depression.

	Anxiety			Depression		
	β	*B(SE)*	*95% CI*	*β*	*B(SE)*	*95% CI*
Age	**−.07****	**−.03(.01)**	**−.04, −.01**	**−.09****	**−.03(.01)**	**−.05, −.01**
Concern about COVID-19	.04	.27(.17)	−.06, .60	−.01	−.08(.17)	−.42, .26
Likelihood of contracting COVID-19	**.06***	**.35(.14)**	**.07, .63**	−.01	−.07(.15)	−.35, .23
Social distancing	.01	.07(.16)	−.25, .39	.04	.23(.17)	−.09, .56
Self-quarantining	.02	.05(.05)	−.05, .14	−.01	−.02(.05)	−.12, .07
Positive mood	**−.15*****	**−.55(.11)**	**−.76, −.33**	**.07***	**.25(.11)**	**.03, .48**
Negative mood	**.10****	**.32(.11)**	**.11, .53**	**.12*****	**.44(.11)**	**.22, .65**
COVID-19 infection status	−.003	−.05(.35)	−.73, .64	.02	.29(.36)	−.42, 1.00
Illness recency	.02	.09(.11)	−.14, .31	**.23*****	**.92(.11)**	**.71, 1.14**
General health	.00	−.002(.16)	−.31, .31	−.02	−.13(.16)	−.45, .19
Education	−.02	−.07(.08)	−.23, .09	.01	.04(.08)	−.13, .20
Income	−.03	−.05(.05)	−.14, .05	−.05	−.09(.05)	−.19, .01
Sex	−.02	−.19(.26)	−.70, .31	.01	.09(.26)	−.43, .61
Race	−.001	−.02(.33)	−.66, .62	.01	.10(.34)	−.56, .75
Relationship status	.05	.52(.30)	−.07, 1.10	−.04	−.42(31)	−1.03, .18
Depression	**.63*****	**.59(.03)**	**.54, .65**	–	–	–
Anxiety	–	–	–	**.59*****	**.63(.03)**	**.57, .69**
Age x concern about COVID-19	−.03	−.01(.01)	−.03, .01	.01	.01(.01)	−.02, .03
Age x likelihood of contracting COVID-19	**−.07****	**−.02(.01)**	**−.04, −.01**	.01	.004(.01)	−.01, .02

Notes. COVID-19 infection status (1 = yes/maybe, 0 = no), sex (1 = male, 0 = female), race (white = 1; non-white = 0), relationship status (1 = married, 0 = not). Significant effects are bolded. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

reported self-quarantining over the past week, with 32.2% indicating 2–6 days and 46.4% indicating 7 days. Further, 20.5% of participants reported currently having or previously having COVID-19.

Correlations

Bivariate correlations were estimated to assess associations among key study variables (see Table 2). Higher anxiety was significantly correlated with greater general concern about COVID-19 and greater perceived likelihood of contracting COVID-19. Higher anxiety was also significantly correlated with more days in self-quarantine, greater negative mood, more recent illness, currently having or previously having COVID-19, less positive mood, and worse general health. Greater depression was significantly correlated with greater general concern about COVID-19 and greater perceived likelihood of contracting COVID-19. Greater depression was also significantly correlated with greater negative mood, more recent illness, currently having or previously having COVID-19, less positive mood, and worse general health. Anxiety and depression were strongly, positively correlated.

Older age was significantly correlated with greater concern about COVID-19, but lower perceived likelihood of contracting COVID-19. Older age was correlated with lower anxiety and depression. In terms of degree of anxiety symptoms, older adults on average reported 'minimal to none' anxiety symptoms ($M = 3.42$, $SD = 4.79$), whereas middle-aged ($M = 5.11$, $SD = 5.72$) and younger adults ($M = 7.06$, $SD = 6.14$) on average reported 'mild' anxiety symptoms. For depressive symptoms, older adults reported 'minimal to none' symptoms ($M = 2.89$, $SD = 4.07$), whereas middle-aged ($M = 5.26$, $SD = 6.18$) and younger adults ($M = 7.47$, $SD = 6.64$) on average reported 'mild' depressive symptoms. Older age was also significantly correlated with greater perceived social distancing, but age was not significantly correlated with days in self-quarantine. Older age was significantly associated with lower likelihood of currently having or previously having COVID-19 and less recent illness.

Regressions

Two multiple regression analyses were conducted to examine whether age and COVID-19 worries (i.e. concern about COVID-19 and perceived likelihood of contracting COVID-19), as well as their interaction terms, were associated with anxiety and depression (see Table 3). Social distancing, self-quarantining, current mood, health, and demographics were included as covariates. Because anxiety and depression are highly comorbid (e.g. Brown et al., 1998), depression was included as a covariate in the model predicting anxiety and vice versa.

The model predicting anxiety was significant, $F(18, 714) = 77.68$, $p < .001$, $R^2 = 0.662$. Older age was associated with lower anxiety, and greater perceived likelihood of contracting COVID-19 was associated with higher anxiety. Concern about COVID-19 was not significantly associated with anxiety.[3] There was a significant interaction between age and perceived likelihood of contracting COVID-19 (see Figure 3). Simple slopes analyses were conducted to decompose the interaction at one standard deviation above and below the centered mean of age. There was a significant, positive association between perceived likelihood of contracting COVID-19 and anxiety at younger age ($\beta = .13$, $p < .001$), but the association was not significant at older age ($\beta = -.01$, $p = .85$). To more precisely probe the interaction and identify at what age the association between age and perceived likelihood of contracting COVID-19 became significant, we tested the moderation using the PROCESS macro for SPSS (Hayes, 2012), excluding the interaction between age and COVID-19 concern, and used the Johnson and Neyman (1936) technique as a simple slopes analysis. For participants under 50 years of age, higher perceived likelihood of contracting COVID-19 was significantly associated with higher levels of anxiety, $ps < .02$. For those 50 years and older, perceived likelihood of contracting COVID-19 and anxiety were not significantly associated, $ps \geq .05$.

The model predicting depression was significant, $F(18, 714) = 84.39$, $p < .001$, $R^2 = 0.680$. Older age was associated with less depression. Concern about COVID-19 and likelihood of contracting COVID-19 were not

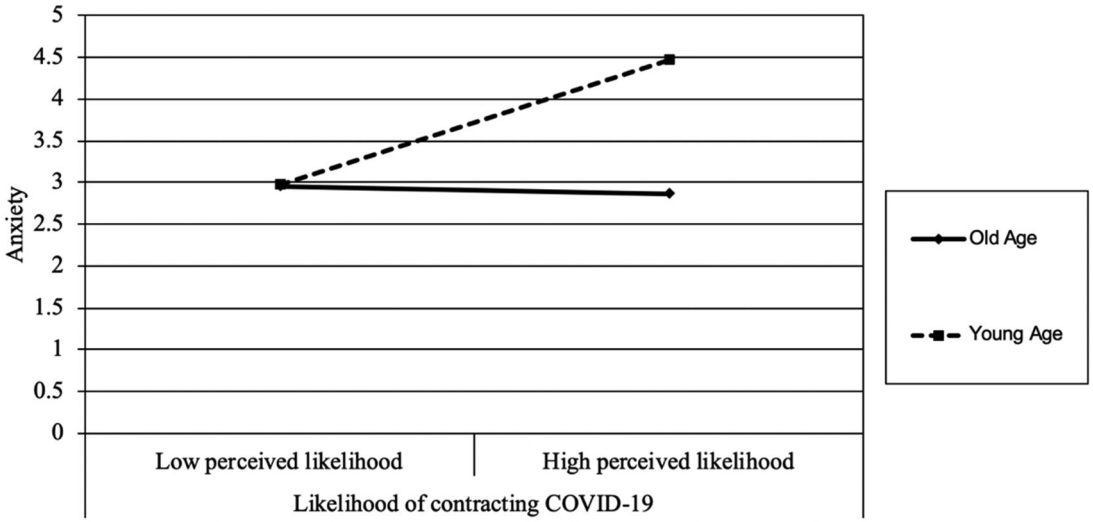

Figure 3. Moderating effect of age (±1 SD) on the association between perceived likelihood of contracting COVID-19 and anxiety.

significantly associated with depression. Neither interaction was significant.

Discussion

COVID-19 represents a global infectious disease outbreak with mental health consequences. This study examined whether age moderated the association between COVID-19 worries and mental health, controlling for preventative health behaviors, current mood, health, and demographic variables. Older age was correlated with lower anxiety and depression during the pandemic. Older age was also correlated with greater general concern about COVID-19, but a lower perceived likelihood of contracting COVID-19. Although greater perceived likelihood of contracting COVID-19 was associated with higher anxiety, this relation was moderated by age. Greater perceived likelihood of contracting COVID-19 was related to higher anxiety among those of younger ages (18–49 years), but not older ages (50+ years).

Overall, our sample reported relatively high rates of anxiety and depression, based on well-validated and commonly used clinical measures. Approximately, 31.7% of participants met the cutoff for identifying probable cases of generalized anxiety disorder (i.e. score equal to or greater than 8 on the GAD-7; Spitzer et al., 2006), and 23.5% of participants met the cutoff for identifying probable cases of major depressive disorder (i.e. score equal to or greater than 10 on the PHQ-9; Kroenke et al., 2001). These percentages are considerably higher than prevalence of generalized anxiety and major depressive disorders in the U.S. adult population. According to the Anxiety and Depression Association of America (ADAA, n.d.), in a given year, 3.1% of the U.S. population aged 18 years and older have generalized anxiety disorder and 6.7% have major depressive disorder. Also, data from the National Health Interview Survey (Centers for Disease Control and Prevention, 2020b), which was collected between April and June of 2019, showed that 8.2% of U.S. adults met the cutoff for probable generalized anxiety disorder (i.e. scores greater than 3 on the GAD-2; Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007) and 6.6% met the cutoff for probable major depressive disorder (i.e. scores greater than 3 on the PHQ-2; Kroenke, Spitzer, & Williams, 2003). Although we cannot make direct comparisons between the two samples due to the different versions of the GAD and PHQ measures, it appears that our sample reported higher levels of anxiety and depression than a national sample pre-pandemic. These findings align with reports that many Americans perceive that their mental health has been negatively affected by the pandemic (Panchal et al., 2020; Pew, 2020).

The majority of the sample (over 75%) also reported at least some level of concern about and some perception of being likely to contract COVID-19. These findings expand upon other research showing that Americans are worried about the impact of the pandemic (Park et al., 2020), which may have potential consequences for mental health. Further, almost half of the sample (46.4%) reported self-quarantining for seven days in the past week and most of the participants (65.1%) reported social distancing a great deal. These findings suggest that most Americans are following the Centers for Disease Control and Prevention (2020a) recommended guidelines for reducing the spread of COVID-19.

The association between older age and better mental health replicate prior research conducted before and during the COVID-19 pandemic (e.g. Bruine de Bruin, 2020; Huang & Zhao, 2020; Löwe et al., 2010). Although greater psychological distress has been reported during the pandemic (Panchal et al., 2020; Pew, 2020), our findings suggest that older age may buffer against anxiety in particular. Specifically, perceived likelihood of contracting COVID-19 was not associated with anxiety in older ages, whereas there was a significant, positive association in younger ages (18–49 years). This finding aligns with other research showing better emotion regulation and management of stress in older age (Schilling & Diehl, 2014). Socioemotional selectivity theory suggests that age differences in emotional well-being stem from a shift in time perspective across adulthood, which is thought to cause a shift in goals related to maximizing positive experiences and avoiding negative experiences (Carstensen, Fung, & Charles, 2003). Potentially, those older in age are better able to regulate their emotions and cope with the stress from the pandemic (Carstensen, 2006). Alternatively, older adults' generally lower levels of anxiety pre-pandemic may have protected them from heightened worry about contracting COVID-19.

In the regression analysis, depression was no longer significantly related to COVID-19 worries when accounting for anxiety and other covariates, although age remained inversely related to depression. This may suggest that worries about COVID-19 largely tap into anxious, rather than depressed, symptomatology. For individuals presenting with anxious symptoms, practitioners may want to ask specifically about worries related to COVID-19, as such information could greatly guide treatment. Further research is also necessary to determine how other variables that may be especially salient during the COVID-19 pandemic (e.g. illness recency) may contribute to depression.

We also found that older age was related to a lower perceived likelihood of contracting COVID-19, replicating prior work (Bruine de Bruin, 2020). This finding is particularly interesting, as older age is related to a higher risk of contracting COVID-19 (WHO, 2020). Older age was associated with a lower rate of COVID-19 infection, but infection status did not account for lower perceived likelihood of contracting COVID-19 in older age ($r_p = -.09$, $p = .01$). Older age was also associated with greater social distancing in our sample (i.e. behavior that reduces exposure to COVID-19 and should reduce likelihood of contracting COVID-19), but not associated with self-quarantining, which replicates prior work (Barber & Kim, 2020). However, greater social distancing did not account for lower perceived likelihood of contracting COVID-19 in older age ($r_p = -.17$, $p < .001$). Therefore, neither lower rates of infection nor greater engagement in social distancing in older age explain the link between age and perceptions of contracting COVID-19. Older age is related to more positivity (Carstensen, 2006), so these findings may indicate greater optimism with age or pessimism in youth. In the context of socioemotional selectivity theory (Carstensen et al., 2003), it is possible that older adults' lower perceived likelihood of contracting COVID-19 may result as a function of avoidance, such that older adults may be choosing to focus on the positives of the current moment by eschewing negative thoughts about contracting COVID-19. However, the risk of COVID-19 does not seem to be lost on older adults. Older age was related to greater concern about COVID-19 in our sample, and greater perceived likelihood of dying from the disease if contracted in another sample (Bruine de Bruin, 2020). More research is needed to understand these differential perceptions.

Of note, our findings do not negate the importance of assessing for psychological distress among both younger *and* older adults. Understanding the mechanisms by which age may protect against the negative effect of the pandemic on mental health may inform interventions for helping people of all ages who are having difficulty coping with the stress and worry from the pandemic. Recent work has suggested that older adults' better emotional well-being may stem from greater mindfulness and present time perspective (Shook et al., 2017; Wilson, Strough, & Shook, 2019). Potentially, mindfulness practices or exercises that encourage focusing on the present moment, rather than focusing too much on the future and worrying or the past and ruminating, may improve mental health during the pandemic. Lower perceived likelihood of contracting COVID-19 in old age may be problematic. Perceiving a higher risk of COVID-19 infection generally predicts greater engagement in preventative health behaviors (e.g. hand washing; Wise, Zbozinek, Michelini, Hagan, & Mobbs, 2020). If older adults perceive a low risk of infection, they may be less likely to engage in preventative health behaviors. Therefore, it is important to emphasize to the public how highly contagious COVID-19 is, particularly highlighting that those of older ages are more vulnerable to contracting the disease.

The present data are cross-sectional and cannot address causal or temporal associations. Longitudinal data are necessary to determine the extent to which COVID-19 experiences predict mental health outcomes or vice versa. All data were self-reported and are thus subject to bias. The use of single items to assess COVID-19 related variables (e.g. concern, perceived likelihood of contracting, social distancing) potentially limits the reliability of the variables, and future work should include more items to strengthen these measures. Our sample was relatively homogeneous in regard to race, with the majority self-identifying as White. Future work should recruit a more racially diverse sample. Despite limitations, our findings provide novel insight into the impact of COVID-19 worries on mental health and suggest that age may protect against mental health consequences of a global pandemic. More research is necessary to understand the mechanisms by which age may be a protective factor. Such information may help inform interventions to aid individuals of all ages in coping with a pandemic, as well as the recovery period.

Notes

1. There was 4.4–5.7% missing data for key study variables. Participants with missing data were excluded from analyses using listwise deletion. When expectation-maximization was used to impute missing data, the patterns of findings remained the same.
2. COVID-19 status was determined based on responses to the current survey and all previous waves of the longitudinal study.
3. When perceived likelihood of contracting COVID-19 was removed from the model, greater concern about COVID-19 was significantly associated with greater anxiety ($\beta = .05$, $p = .04$). The interaction between age and concern about COVID-19 was not significant ($p = .10$).

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