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Trait mindfulness is negatively associated with distress related to COVID-19

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A B S T R A C T

Research suggests that mindfulness is associated with psychological health including a healthier response to stressors.
Objective: This research tested associations between trait mindfulness and mental health factors related to the novel coronavirus (COVID-19).
Methods: Two studies (Study 1 $N = 248$ college students; Study 2 $N = 300$ U.S adults) assessed trait mindfulness, perceived stress and anxiety, worry about the coronavirus, and anticipated negative affect of a coronavirus diagnosis. Additionally, Study 2 assessed depressive symptoms and coping with the coronavirus.
Results: In both studies, findings indicated that individuals higher in trait mindfulness reported less stress and anxiety. Higher mindfulness in both studies was also associated with less worry about the virus and anticipating less negative affect if one gets the virus. In Study 2, trait mindfulness was negatively related to depression, and numerous associations between mindfulness and coping emerged, showing higher trait mindfulness was associated with healthier strategies in coping with coronavirus.
Conclusions: These data are consistent with research that has revealed that those who think and act more mindfully are less stressed and anxious. By revealing these associations with mindfulness in the context of a real-world, novel stressor, this research makes an important contribution to the literature.

Research suggests COVID-19 has increased anxiety and depressive symptoms around the world (Montemurro, 2020; Wang et al., 2020), and it is likely having a similar psychological impact in the United States. Indeed, independent polls show Americans have reported a dramatic increase in their stress levels and experts express concern about a historic influx of mental health problems (Achenbach, 2020; Wan, 2020). The stay-at-home orders that have been issued by the states, which include people working from home and the closure of schools, has likely fueled the increased stress and anxiety. How can people help manage and effectively cope with this incessant stress and worry? Mindfulness is one psychological trait that may be helping people to adjust and cope during this stressful time.

Mindfulness is a nonjudgmental awareness of and focus on the present moment and it is rooted in Buddhist philosophy (K.W. Brown, Ryan, & Creswell, 2007; Hölzel et al., 2011). According to researchers, one is engaged in mindfulness when they are purposely focusing their attention on their ongoing, present experience while maintaining a nonjudgmental or less judgmental attitude (K.W. Brown & Ryan, 2003; Goodman, Quaglia, & Brown, 2015; J. Kabat-Zinn, 2003). Mindfulness

involves openness, awareness, and receptive attention (Black, 2011). In other words, mindfulness is being present in the moment and letting whatever thoughts happen – *happen*. Although many agree on its basic definition, there are different forms of mindfulness (for an overview, see K.W. Brown et al., 2007). For example, mindfulness can be trait-like, in which individuals may have high or low (or medium) levels that are stable across time (Black, 2011). Individuals who are high in trait mindfulness often and easily experience mindful attention, thoughts, and behaviors (Goodman et al., 2015). However, mindfulness has also been conceptualized as something people can learn and develop. With this conceptualization, mindfulness is a mental state that one can work toward, with training and practice (Black, 2011; K.W. Brown et al., 2007).

Substantive research shows there are many psychological benefits to trait mindfulness. Higher levels of the trait have been correlated with psychological health. For example, mindfulness is linked to lower levels of self-reported anxiety and depression, as well as higher levels of subjective well-being, life satisfaction, and compassion (Broderick, 2005; K. W. Brown et al., 2007; Keng, Smoski, & Robins, 2011; Klainin-Yobas

et al., 2016; Weinstein, Brown, & Ryan, 2009; for a review see, Tomlinson, Yousaf, Vittersø, & Jones, 2018). One pathway through which mindfulness may confer these psychological benefits is by facilitating more effective coping with stressful life events. Research suggests that people who are more mindful cope better with stressors (e.g., Bergin & Pakenham, 2016; Bergomi, Ströhle, Michalak, Funke, & Berking, 2013; K.W. Brown, Weinstein, & Creswell, 2012; Hou, Ng, & Wan, 2015) – for example, they may be more likely to engage in healthy coping strategies like acceptance and less likely to engage in unhealthy strategies like rumination (de Vibe et al., 2018; Palmer & Rodger, 2009; Petrocchi & Ottaviani, 2016; Sriwilai & Charoensukmongkol, 2016; Thompson, Arnkoff, & Glass, 2011; Tomlinson et al., 2018; Weinstein et al., 2009).

Although the research is limited, there have been studies to examine if trait mindfulness benefits people dealing with real-world stressors. Overall this research has shown that people who are higher in trait mindfulness experience less anxiety and depression, as well as less negative cognitive responses to various stressful events such as the threat of military deployment (Trousselard, Steiler, Claverie, & Canini, 2012), attending drug addiction treatment (Shorey, Brasfield, Anderson, & Stuart, 2015), experiencing racial and ethnic discrimination (Shallcross & Spruill, 2018), experiencing long-term financial hardship (Sun, Lam, Chan, Li, & Chung, 2020), and relationship stress (Barnes, Brown, Krusemark, Campbell, & Rogge 2007). When writing about actual stressful events from their past, individuals who are higher in trait mindfulness have also shown better emotional regulation and faster physiological recovery (Fogarty et al., 2015).

1. Present research

The research described above suggests that being high in the trait of mindfulness could be a protective factor during this pandemic. Americans have likely experienced high levels of distress due to COVID-19, a disease for which there has been vast uncertainty. For example, the virus that causes it spreads in the air and on surfaces and is more contagious than influenza, but there is no pharmacological treatment or FDA-approved vaccine. Additionally, information about how to protect oneself from the virus has rapidly changed. In early 2020, Americans were told not to wear masks, but that changed a few weeks later, and several states then required people to wear them. Taken together, the uncertainty coupled with the novel situation for most has been a recipe for distress. The present research tested if trait mindfulness is associated with less distress during this real-world stressor. By examining mindfulness in the crux of an active stressor, this research makes a novel contribution to the literature.

2. Study 1

The primary goal was to examine correlations between trait mindfulness and respondents' current stress and anxiety, worry and anticipated affective reaction to COVID-19. Based on previous research, we hypothesized that higher trait mindfulness would be associated with lower current stress and anxiety. We further hypothesized that higher trait mindfulness would be associated with lower worry about the virus and anticipating less negative affect if one contracts it. The latter hypotheses are consistent with the overall notion that mindfulness can reduce stress and anxiety, but the variables are specific to stressful emotions related to the virus.

Along with the primary goal, a secondary goal was to examine the above associations with mindfulness after controlling for general health, which may be a confounding variable. For example, research has found that higher mindfulness is associated with reports of better quality of life and better physical health (M.S. Christopher & Gilbert, 2010; Khoury, Sharma, Rush, & Fournier, 2015; Murphy, Mermelstein, Edwards, & Gidycz, 2012; Roberts & Danoff-Burg, 2010). A higher level of physical health is associated with better immune system functioning (e.g., Nieman & Wentz, 2019). Thus, one could argue that mindfulness relates to

stress and anxiety about COVID-19 only because people who are more mindful are also healthier. Examining correlations between mindfulness and stress and anxiety while controlling for general health can provide insight into whether mindfulness is a unique protective factor, apart from general health.

3. Sample size determination and data availability

In both studies, we sought to collect enough participants to find a significant correlation of 0.20 or greater with 80% statistical power. We conducted a power analysis using G*Power for correlations using an effect size estimate of $r = 0.20$ and a statistical power of 80%. These parameters resulted in a required sample size of 193 participants. We sought to collect at least that number of participants in each study given time and resource constraints. In both studies, we ended up collecting quite a few more participants, but data was not analyzed until the entire sample was collected. The data examined in both studies is included at an Open Science Framework website in SPSS format: https://osf.io/23y9k/.

4. Method

4.1. Participants

Participants included American college students ($N = 251$) of which 68% were female and the average age was 19.17 ($SD = 1.56$). The majority of participants were White (89%; 3% of whom were of Hispanic ethnicity) with some African American (4%) and Asian American (3%) participants (4% other races or not reported). Three participants were dropped from analyses because they reported having been diagnosed with COVID-19.

4.2. Procedure

Data collection occurred over an approximately two-week period, beginning March 30th, 2020 and ending April 15th, 2020. University students in Introductory Psychology courses were invited to enroll in a study on "Beliefs and expectations about the novel coronavirus" which they could link to via a study scheduling website maintained by the university. After self-selecting into the study, participants completed a consent form, and then responded to questions that assessed their trait mindfulness, perceived stress, state anxiety, worry about COVID-19 and their anticipated negative emotion if they contracted the virus.[1] In exchange for participating, students received enrichment credit in their course.

4.3. Measures

4.3.1. Mindfulness

To assess trait mindfulness, we used the 12-item Cognitive and Affective Mindfulness scale (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). Participants read statements about how often they have various thoughts and feelings (e.g., "I am able to accept the thoughts and feelings I have", "I can usually describe how I feel at the moment in considerable detail", "I am easily distracted"), rating them on a 4-point scale from rarely/not at all (1) to almost always (4). We averaged across the 12 items for an overall mindfulness score ($\alpha = 0.78$).

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[1] Both of these surveys included measures (e.g., risk perceptions of coronavirus, behavior intentions, numeracy, knowledge) that were collected to test other hypotheses about coronavirus. None of these measures were related to the present study's purpose or hypotheses about mindfulness. A description of all measures is included in the Appendix.

4.3.2. Perceived stress

The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) was used to assess participants' appraisals of distress. The PSS includes 10 items that ask individuals to report the extent to which their lives have been unpredictable and overloaded during the previous month. The items are general rather than focused on specific events or experiences. Examples of questions include, "In the last month, how often have you felt nervous or "stressed?" "..how often have you felt that you were unable to control the important things in your life?", and ".. how often have you been upset because of something that happened unexpectedly?". Participants indicated the frequency they felt this way using a 5-point scale from never (0) to very often (4). To create a composite, we summed across the 10 items ($\alpha = 0.78$).

4.3.3. State anxiety

To assess state anxiety, we adapted five items from the State and trait anxiety inventory (STAI: Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Participants indicated how they felt right now at this moment on a 4-point scale from not at all (1) to very much so (4). The statements were "I feel calm (reverse scored)", "I feel tense", "I feel nervous", "I am presently worrying over misfortunes" and "I am jittery". The five items were combined into a composite ($\alpha = 0.86$).

4.3.4. Worry

Three items assessed worry about the novel coronavirus. The items were similar to how researchers measure worry for other health threats (e.g., cancer; Hay, McCaul, & Magnan, 2006). We asked participants, "How worried are you about developing coronavirus?", "When you think about coronavirus, to what extent do you feel fearful?" and "To what extent are you concerned about getting coronavirus?" All questions were on a 7-point scale, from not at all (1) to extremely (7). We averaged the three items ($\alpha = 0.91$).

4.3.5. Anticipated negative affect

We asked participants to "Imagine if you did develop the coronavirus, to what extent do you think you would you feel...? Participants indicated the extent they would feel four emotions (regret, guilt, anger, fear) on a 7-point scale, from not at all (1) to a great deal (7). We combined ratings for these four emotions to create a composite of anticipated negative affect ($\alpha = 0.83$).

5. Results

5.1. Descriptives

Participants responded to the statement, "In general, would you say your health is...Excellent, Very good, Good, Fair, or Poor? (reverse coded; M= 3.85; SD = .85). The majority of participants reported they were in "Excellent" ($n = 60$), "Very good" ($n = 105$), or "Good" ($n = 69$) health with much fewer reporting "Fair" ($n = 14$) or "Poor" ($n = 0$) health. We also asked participants, do you have a chronic health condition to which 35 participants answered yes.

The mean of participants' trait mindfulness scores was 2.55 ($SD = 0.46$). Participants reported more perceived stress than is normative for college students ($M = 32.92$; $SD = 5.90$, relative to a normative mean of 18; Roberti, Harrington, & Storch, 2006). On average, they reported a moderate amount of anxiety ($M = 2.09$; $SD = 0.76$). Their average worry about COVID-19 was higher than the midpoint of the scale ($M = 3.73$; $SD = 1.45$), which was also true of their anticipated negative affect ($M = 4.22$; $SD = 1.53$).

5.2. Primary analyses - associations with mindfulness

Correlations among primary variables are presented in Table 1. Consistent with hypotheses, mindfulness was associated with the primary variables in the expected directions (see Table 1). That is, higher

Table 1
Correlations between trait mindfulness and primary variables (Study 1).

$N = 248$	1	2	3	4	5	6
1. Mindfulness	1					
2. Perceived stress	−0.44**	1				
3. State anxiety	−0.39**	0.47**	1			
4. Worry about coronavirus	−0.21**	0.27**	0.53**	1		
5. Anticipated negative affect	−0.19**	0.25**	0.40**	0.53**	1	
6. Self-reported health	0.18**	−0.20**	−0.25**	−0.28**	−0.10	1

$**p < .01$; $*p < .05$. 95% Confidence intervals [CI lower, upper]; p-value. Mindfulness/perceived stress $[−0.54,-0.33]$; $p < .001$; Mindfulness/state anxiety $[−0.49,-0.27]$; $p < .001$; Mindfulness/worry $[−0.33,-0.09]$; $p = .001$; Mindfulness/anticipated negative affect $[−0.31,-0.07]$; $p = .003$; Mindfulness/self-reported health $[0.06,0.30]$; $p = .004$.

trait mindfulness was significantly correlated with reports of less stress and lower anxiety as well as less worry about COVID-19. Higher mindfulness also related to anticipating less negative emotion (e.g., less regret, less fear) if one did get the virus. Other significant associations were also observed. For example, as participants' perceived stress and state anxiety increased, they also reported more worry about COVID-19 and anticipated more negative emotion should they contract the virus.

5.3. Secondary analyses - associations with mindfulness after controlling for general health

The next analyses examined if the above correlations remained significant even after controlling for general health. As shown in Table 1, general health was significantly correlated with mindfulness as well as all other variables (except anticipated negative emotion). These associations showed that as individuals reported better health, they reported being more mindful, having less stress and anxiety, and were less worried about the virus. Secondary analyses showed that when controlling for these associations with general health, mindfulness remained significantly associated with stress, anxiety, worry about the virus, and anticipated negative emotion, $rs = −0.42, −0.36, −0.17$ and $− 0.17$, all $ps < 0.01$, respectively.

6. Discussion

Previous research has connected trait mindfulness to less distress, and the present study tested this idea in the midst of the novel coronavirus pandemic. The results showed that higher trait mindfulness was associated with lower distress - reporting less stress in the last month and less current anxiety - as well as lower worry about COVID-19 and anticipating less negative emotion should they get it. Taken together, these findings suggest that people who are higher in trait mindfulness may have maintained better psychological health during the pandemic.

In addition to finding meaningful associations with mindfulness, analyses showed these associations remained significant after controlling for general health. Because general health has been related to mindfulness (Grossman, Niemann, Schmidt, & Walach, 2004; Murphy et al., 2012), and general health likely relates to people's current stress and anxiety (e.g., people who are healthier have a lower risk of severe complications from COVID-19, which may reduce their stress and anxiety), this is an important variable to disentangle in the association between mindfulness and distress. By finding that mindfulness was still associated with stress and anxiety after controlling for general health, findings suggest mindfulness could be a unique protective factor.

Why might mindfulness have potentially protected people during the pandemic? One reason might be that being more mindful may have facilitated healthier coping. Coping refers to the thoughts and behaviors people use to protect themselves from stressors (R.S. Lazarus, 1999).

Some coping strategies are more effective in reducing stress and anxiety than others (Carver, Scheier, & Weintraub, 1989), and mindfulness may channel some of these strategies. For example, acceptance is a type of coping strategy in which one believes that a stressful or difficult situation they are facing is real and needs to be addressed (Carver et al., 1989). Acceptance is akin to mindfulness which represents an orientation toward accepting one's experience without judgement (Bishop et al., 2004). The coping strategy of acceptance has also been linked to less distress in adults who are coping with actual health-related stressors such as pain (Masedo & Esteve, 2007) and disease or chronic conditions (e.g., C.S. Carver et al., 1999; Esteve, Ramírez-Maestre, & López-Mar-tínez, 2007; Pérez et al., 2009). Although recent research supports the notion that mindfulness may be related to engaging in acceptance and other healthy coping strategies (e.g., Donald & Atkins, 2016; Finkel-stein-Fox, Park, & Riley, 2019; Nowlan, Wuthrich, & Rapee, 2014), there have been no studies to test these ideas in the crux of a pandemic.

7. Study 2

Our primary goal of Study 2 was to replicate our findings of Study 1 with a general adult sample. We again examined correlations between trait mindfulness, perceived stress, current anxiety, and worry and anticipated negative emotion of COVID-19. We had the same hypotheses as Study 1, expecting that people who scored higher on trait mindfulness would report lower levels of stress and anxiety, be less worried about the virus, and anticipate less negative emotion should they get it. In Study 2, we also assessed depressive symptoms. Similar to associations with anxiety and worry, the expectation was that higher mindfulness would also relate to lower depressive symptoms, which is an idea consistent with previous research (Jimenez, Niles, & Park, 2010; Petrocchi & Ottaviani, 2016; for a review, see Tomlinson et al., 2018). Additionally, in Study 2, drawing on the research on mindfulness and coping, we hypothesized that people who report higher trait mindfulness would be more likely to report using healthy strategies (e.g., acceptance) and less likely to report using unhealthy strategies (e.g., denial).

7.1. Participants

Participants included 300 American adults, ranging in age from 25 to 73 ($M = 35.6$, $SD = 10.0$). Of these participants, 42% were female, and the majority were White (80%; 7% of whom were of Hispanic ethnicity) with some African American (7%) and Asian American (9%) participants (4% other races). None of these participants reported having been diagnosed with COVID-19.

7.2. Procedure

Data collection occurred on May 12th, 2020. Adults were recruited through Prolific. Prolific is an international survey data company that specializes in recruiting participants for behavioral research, and maintains a pool of approximately 70,000 respondents. All potential participants have completed demographic information and any participant who matches study criteria will see the study on their dashboard and can choose to opt-in. Participants are compensated for their participation with at least $6.50 USD/per hour. The eligibility criteria for the current study included being a U.S. citizen, being at least 25 years of age, and having no diagnosed disease (heart disease, diabetes or other). Participants were compensated $10.48 per hour with the study taking most people between 15 and 20 min. After reading a consent form, they answered questionnaires that assessed trait mindfulness, perceived stress, state anxiety, depressive symptoms, worry and anticipated negative emotion, and coping strategies.[1]

7.3. Measures

Except for the addition of coping strategies and depression, the measures in Study 2 were identical to Study 1. Reliability for the composite scores for mindfulness, perceived stress, state anxiety, worry, and anticipated affect were, αs = 0.84, 0.82, 0.87., 0.96 and 0.84, respectively.

7.3.1. Coping strategies

To assess various positive and negative coping strategies, we used items adapted from the Brief Cope (C.S. Carver, 1997). Participants were asked to think about the ways of coping they have used to manage their stress related to the pandemic. They answered twenty statements that assessed 10 coping strategies: acceptance, denial, substance use, planning, active coping, positive reframing, venting, using emotional support, religion, and self-distraction. Each subscale included two statements for which participants indicated how often they have been using this coping strategy on a 4-point scale from I haven't been doing this at all (1) to I've been doing this a lot (4).

7.3.2. Depressive symptoms

Five questions about depressive symptoms were adapted from the health status and quality of life measure SF-36 (Ware & Sherbourne, 1992). The items were "During the past four weeks, how much of the time have you felt so down in the dumps that nothing could cheer you up?", "…how much of the time have you been a happy person?, "…how much of the time have you felt downhearted and blue?, "…how much of the time did you have a lot of energy?, and "…how much of the time did you feel worn out? All questions were on a scale from All of the time (1) to None of the time (6). The five items were combined into a composite of depressive symptoms (α = 0.89).

8. Results

8.1. Descriptives

Participants responded to the statement, "In general, would you say your health is…Excellent, Very good, Good, Fair, or Poor? (reverse coded; $M= 3.71$; $SD = .87$). The majority of participants reported they were in "Excellent" ($n = 57$), "Very good" ($n = 123$), or "Good" ($n = 96$) health with much fewer reporting "Fair" ($n = 24$) or "Poor" ($n = 0$) health. We also asked participants, do you have a chronic health condition to which 27 participants answered yes.

The mean of participants' trait mindfulness was 2.85 ($SD = 0.48$). The mean for perceived stress was 27.42 ($SD = 5.94$). On average, they reported fairly low anxiety ($M = 1.82$; $SD = 0.67$) and depression ($M = 2.78$; $SD = 0.98$). Their average worry about the virus was higher than the scale midpoint ($M = 3.91$; $SD = 1.66$), and this was true of their anticipated negative affect as well ($M = 3.86$; $SD = 1.62$).

8.2. Primary analyses - associations with mindfulness

Correlations among primary variables are presented in Table 2. Similar to Study 1, significant positive correlations were observed between stress, anxiety, worry about COVID-19, and anticipated negative emotion. Depressive symptoms were positively associated with all of these variables as well, and had the strongest associations, of all variables, with perceived stress. Consistent with hypotheses and Study 1, trait mindfulness was significantly related to all of variables. As shown in Table 2, higher mindfulness was associated with lower stress, less anxiety, less depression, less worry about the virus, and anticipating less negative emotion should one get the virus.

8.3. Secondary analyses - associations with mindfulness controlling for general health

Secondary analyses showed that higher mindfulness was significantly associated with better self-reported general health (these associations are in Table 2). General health was also associated with all other

Table 2

Correlations between trait mindfulness and primary variables (Study 2).

N = 300	1	2	3	4	5	6
1. Mindfulness	1					
2. Perceived stress	−0.53**	1				
3. State anxiety	−0.35**	0.49**	1			
4. Depressive symptoms	−0.55**	0.77**	0.48**	1		
5. Worry about coronavirus	−0.19**	0.33**	0.45**	0.27**	1	
6. Anticipated negative affect	−0.27**	0.31**	0.37**	0.24**	0.63**	1
7. Self-reported health	0.25**	−0.25**	−0.21**	−0.34**	−0.24**	−0.15*

**$p < .01$; *$p < .05$. 95% Confidence intervals [CI lower, upper]; p-value. Mindfulness/perceived stress [−0.61,-0.44]; $p < .001$; Mindfulness/state anxiety [−0.44,-0.25]; $p < .001$; Mindfulness/depressive symptoms [−0.62,-0.47]; $p < .001$; Mindfulness/worry [−0.30,-0.08]; $p = .001$; Mindfulness/anticipated negative affect [−0.37, −0.16]; $p < .001$; Mindfulness/self-reported health [0.14,0.35]; $p < .001$.

primary variables. When controlling for general health, mindfulness remained significantly associated with stress, anxiety, depression, worry, and anticipated negative affect, $rs = −0.50, −0.32, −0.50, −0.14$ and $− 0.25$, all $ps < 0.05$, respectively.

8.4. Mindfulness and coping strategies

Table 3 presents the correlations with the coping strategies. Recall that six positive strategies (e.g., acceptance) and four negative strategies (e.g., substance use) were assessed. Correlation analyses showed that mindfulness was significantly related to all of the positive coping strategies. The strongest associations were with seeking emotional support and acceptance such that those who scored higher in trait mindfulness were more likely to report using these strategies to cope with the pandemic. Mindfulness was also related to two of the four negative strategies, suggesting greater mindfulness was associated with being less likely to report the coping strategies of substance use and denial. It was unrelated to venting and distraction.

9. Discussion

The findings of this second study replicated the findings of Study 1: Higher trait mindfulness was associated with less stress and anxiety as well as less worry and negative emotion about COVID-19. In addition, mindfulness was related to less depressive symptoms, which is consistent with much research (Jimenez et al., 2010; for a review, see Tomlinson et al., 2018). Moreover, higher mindfulness was associated with the use of more healthy coping strategies, like acceptance, and less use of unhealthy strategies like substance use. Together, the findings suggest that mindfulness may be one factor that has protected people's psychological health in the crux of the real-world crisis.

Table 3

Correlations between trait mindfulness and coping strategies (Study 2; N = 300).

Positive coping strategies			
	r	95% CI [lower,upper]	p-value
Acceptance	0.24**	0.13,0.34	<0.001
Seek support	0.26**	0.15,0.36	<0.001
Planning	0.15**	0.04,0.26	0.008
Reframing	0.22**	0.11,0.33	<0.001
Active coping	0.22**	0.11,0.33	<0.001
Religion	0.12*	0.01,0.23	0.034

Negative coping strategies			
	r	95% CI [lower,upper]	p-value
Denial	−0.16**	−0.27,-0.05	0.005
Substance use	−0.16**	−0.27,-0.05	0.006
Venting	−0.04	−0.15,0.07	0.523
Distraction	−0.09	−0.02,0.20	0.139

** $p < .01$.
* $p < .05$.

As predicted, mindfulness was associated with increased acceptance of the pandemic. Findings also showed mindfulness was associated with other healthy coping strategies, like seeking social support and positive reframing. While research suggests that not at all types of emotion-focused coping are beneficial (Carver et al., 1989), these two strategies are arguably some of the best. For example, many studies have connected social support seeking to lower anxiety and depression during stressful times (Brissette, Scheier, & Carver, 2002; C.S. Carver et al., 1999; Mosher, Prelow, Chen, & Yackel, 2006). Research also shows that positive reframing or reappraisal consistently relates to better psychological and physical health (for a review, see Nowlan et al., 2014). In fact, this latter strategy has recently been connected to the trait of mindfulness. Across several samples of individuals, researchers found that higher trait mindfulness was associated with positive reappraisal of stressors (Hanley & Garland, 2014; also see A.W. Hanley, Garland, & Tedeschi, 2017). Together, these and the present findings suggest that those higher in trait mindfulness could have reinterpreted the pandemic; for example, maybe they saw it as an opportunity to spend more time with family or to develop new skills they always wanted to learn.

Of note, higher mindfulness was also related to more problem-focused coping. Problem-focused coping refers to doing something to deal with a stressor directly (Lazarus & Folkman, 1984). This type of coping has been linked to better psychological and physical health outcomes (see Penley, Tomaka, & Wiebe, 2002 for a meta-analysis). In the present study, those who were more mindful reported they were more likely to be coping with the pandemic by using two problem-focused strategies – thinking hard about what steps to take (i.e., planning) and taking action to make the situation better (i.e., active coping).

Although mindfulness significantly correlated with all of the positive coping strategies, it correlated with only two of the negative strategies (and the correlations were smaller in magnitude). The associations showed that those higher in mindfulness were less likely to report denying the pandemic and using alcohol to cope with it. The denial association fits conceptually with the mindfulness construct (i.e., as receptive and non-judgmental), as well as research that has connected mindfulness to less avoidance (e.g., Donald & Atkins, 2016). We also found that those higher in trait mindfulness were less likely to report using alcohol to cope, which is consistent with previous research (Christopher, Ramsey, & Antick, 2013). This association between mindfulness and alcohol could also be related to emotions like anxiety and depression (e.g., Pearson, Brown, Bravo, & Witkiewitz, 2015). For example, individuals who have more of these negative emotions may be less trait mindful and more likely to engage problem drinking. In general, more research is needed to test associations between trait mindfulness and negative coping strategies including with real-world events. Future research might also explore reasons why mindfulness may be more strongly related to positive compared to negative coping strategies.

10. General discussion

In two studies, of college students and general adults, we found

consistent significant associations between trait mindfulness and distress surrounding the novel coronavirus pandemic. Findings from both studies revealed that higher mindfulness was associated with less stress and anxiety, less depressive symptoms, as well as less worry and negative emotions surrounding the virus. Higher mindfulness was related to lower distress, even after accounting for general health. Additional findings showed that people who were more mindful were more likely to report the use of healthy coping strategies to deal with the pandemic; they were also less likely to report some of the unhealthy strategies. These studies add to accumulating research connecting mindfulness to psychological health (e.g., Tomlinson et al., 2018) yet extend this research to the real-time stressful event of COVID-19.

There are a number of explanations for why mindfulness may protect people from their stressors related to COVID-19. One explanation is related to coping (Götmann & Bechtoldt, 2021). Study 2 linked higher trait mindfulness to the use of several positive coping strategies (e.g., seeking social support, acceptance) which have also been linked to less distress in response to stressful events (e.g., Brissette et al., 2002). Although mindfulness was significantly correlated with these different strategies, the correlations were, at best, modest. For example, the strongest association was with seeking social support, which was $r = 0.26$. The strength of these correlations may suggest that mindfulness may relate to negative emotions like anxiety and depression not solely because of coping strategies. Indeed, mindfulness *itself* can be a coping strategy as mindfulness min interventions have shown (Khoury et al., 2015). However, even before coping occurs, mindfulness may relate to what initially produces and fuels anxiety – that is, recurring negative thoughts about a stressor. For example, intrusive thoughts are negative, self-oriented, emotionally-charged thoughts that interrupt one's thinking (Clark & Rhyno, 2005). Mindfulness can reduce these thoughts (Shipherd & Fordiani, 2015). Researchers have recently argued that repeated media exposure about COVID-19 is likely increasing people's levels of distress (Garfin, Silver, & Holman, 2020), and this includes the potential for intrusive thoughts. Being more mindful may reduce the likelihood of these thoughts, or if mindful people have these thoughts, they may be better able to deal with them. For example, they may see them as detached from the self, and short-lived rather than stable reflections of the world (Bishop et al., 2004; K.W. Brown et al., 2007; Thompson et al., 2011).

Mindfulness may also help people when it comes to misinformation, which researchers argue can be threatening and lead to more anxiety about COVID-19 (Garfin et al., 2020). On one hand, being more mindful may simply reduce exposure to misinformation on social media at least. For example, in one study, researchers found that mindfulness was associated with being less likely to have an "addiction" to social media, which was defined as time spent on and perceived negative impact of social media (Sriwilai & Charoensukmongkol, 2016). On the other hand, mindfulness could also reduce susceptibility to misinformation, as it is a trait that is associated with focus and mental clarity (K.W. Brown & Ryan, 2003).

Another explanation for why mindfulness may protect us in the crux of a stressful situation is that mindfulness may promote healthier behavior. Some studies have found that more mindful individuals are more likely to practice preventive behaviors and less likely to engage in risky ones (Gilbert & Waltz, 2010; Roberts & Danoff-Burg, 2010). During the pandemic, people who are higher in trait mindfulness may be more likely to do behaviors they think will protect them, such as taking vitamins and exercising. They may also have experienced more positive mood when doing these healthy behaviors – research reveals that being more mindful can increase positive mood related to engaging in certain behaviors (Meier, Noll, & Molokwu, 2017). There has also been research to show that interventions that encourage mindfulness (e.g., Kristeller, 2015) can promote healthier behavior.

Although our research was focused on trait mindfulness, one implication is that engaging in more mindful practices (e.g., attending to the moment, trying to be less judgmental about daily experiences, accepting

things as they are, etc.; Heppner & Shirk, 2018) could result in better mental health in the age of COVID-19 or future pandemics (Antonova, Schlosser, Pandey, & Kumari, 2021). In fact, research has found that mindfulness can be cultivated, via one-time or long-term behavioral interventions, which can then reduce stress-related emotions (e.g., Keng et al., 2011). These interventions can also increase healthier behaviors (Jordan, Wang, Donatoni, & Meier, 2014). One of the most common mindfulness interventions is the Mindfulness Based Stress Reduction program (MBSR; for a description, see J. Kabat-Zinn, 2009). In healthy, non-clinical samples, research shows MBSR can have medium to large effects on individuals' subsequent (including up to 19 weeks later) depression, stress, and anxiety (Khoury et al., 2015; also see Hofmann, Sawyer, Witt, & Oh, 2010; Sharma & Rush, 2014). State mindfulness may do similar things as trait mindfulness. For example, one reason MBSR may be successful is because it encourages positive coping strategies (Sears & Kraus, 2009). In sum, even if one is not mindful by nature, perhaps they could still learn to develop and practice mindful techniques they could use to help them adapt to real-world stressors. However, more research, both longitudinal and experimental work, is necessary to make conclusions along these lines.

10.1. Limitations

Our studies are not without limitations. First, our studies are based entirely on self-reported data and are therefore susceptible to criticisms leveled at self-reported data such as social-desirability concerns and problems with retrospective reporting. Related to this, another limitation relates to the content and valence overlap among our measures. For example, perceived stress, worry, anxiety, and depression overlap in their valence, defined as the pleasantness of affect (Barrett, 1998). In fact, researchers have argued that overlapping valence may account for some of the association often observed between anxiety and depression (Barrett, 1998). It is not clear to what extent valence overlap among our measures influenced the strength of associations. However, additional research with different ways of measuring these constructs can shed light on this issue. A third limitation is that our data is correlational in nature and other types of studies are necessary to provide more information about causal connections between trait mindfulness, worry, and coping with coronavirus. Although our data is entirely consistent with previous work on mindfulness, both correlational and experimental, these issues limit the conclusions of this research.

11. Conclusion

Two studies showed that trait mindfulness is negatively associated with stress, anxiety, and depression associated with the COVID-19 pandemic. Furthermore, people higher in trait mindfulness reported using better coping strategies related to the virus. It appears that trait mindfulness is a protective factor for distress created by a deadly pandemic.

CRediT authorship contribution statement

Compliance with ethical standards

Appendix A

Study 1 included measures that assessed the following variables. The exact measures and examples of questions can be found in the Methods section of the paper under Study 1.

– Trait Mindfulness
– Perceived stress
– State anxiety
– Worry about coronavirus
– Anticipated negative affect
– Self-reported physical health
– Demographics (age, sex, race, year in school)

In addition to these variables, Study 1 also assessed the variables listed below. The purpose of assessing these variables was to examine associations among risk perceptions, knowledge and behavior, and further to examine if personality traits or numeracy ability moderated associations. These measures were used for other hypotheses not related to the current project.

– Risk perceptions of coronavirus (e.g., How likely is it that you will get the coronavirus at some point in the future?)
– Past health behaviors related to coronavirus (e.g., In the last two weeks, how often have you been doing the following behaviors? - Wearing a mask)
– Behavior intentions (e.g., How likely is it that you will talk to your doctor in the near future to get advice on ways to reduce your risk of the coronavirus?)
– Knowledge about coronavirus (e.g., According to the CDC, who is most at risk of developing complications or severe symptoms of coronavirus that may result in death?)
– Trait optimism (Life orientations test-Revised; Scheier, Carver, & Bridges, 1994)
– Personality (Big 5; 20-item Mini-IPIP; Donnellan, Oswald, Baird, & Lucas, 2006)
– Numeracy ability (3 items adapted from previous scales; Lipkus, Samsa, & Rimer, 2001).

Study 2 included all of the measures as above except for past health behaviors. Study 2 also included the additional measures of coping and depressive symptoms. These measures are described in the paper in the Methods section under Study 2.

Finally, Study 2 included an exploratory short measure of trait mindfulness that is in development by the second author. As part of this separate project, participants also completed a measure of state mindfulness (the Toronto Mindfulness Scale; Lau, Bishop, & Segal, 2006).

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