The Role of Mindfulness and Compassion in Predicting Early Adults' Subsequent Mental Health, Coping and Compliance with Health Guidelines during the COVID-19 Pandemic:
A Prospective Longitudinal Study

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Abstract

Objective: The present study examined whether mindfulness and empathic concern prospectively predict coping and compliance during the COVID-19 pandemic, and tested several theorized mediators of these prospective relationships.

Participants: Participants were $N = 736$ young adults from a three-wave longitudinal study on mindfulness that took place over a year. The third assessment wave took place in May, 2020 during the COVID-19 pandemic.

Methods: Participants completed self-report measures of trait mindfulness, compassion, well-being, internalized distress, coping, and compliance.

Results: Results of autoregressive cross-lagged panel mediation models revealed the mindfulness predicted better coping via greater well-being and lower internalized distress. Greater compassion was linked with greater adherence to CDC guidelines through greater well-being.

Conclusions: Findings suggest that trait mindfulness and compassion play an important role in college students' coping and compliance during the pandemic, and point to potential intervention targets.

Keywords: mindfulness, compassion, empathic concern, COVID-19, coping, face mask, face mask wearing, social distancing, health behaviors, preventative behaviors

The Role of Mindfulness and Compassion in Predicting Early Adults' Subsequent Mental Health, Coping, and Compliance with Health Guidelines during the COVID-19 Pandemic:

A Prospective Longitudinal Study

The COVID-19 pandemic has been linked to significant increases in life stress and declines in mental health among adults (Kang et al., 2020; Rajkumar, 2020; Wang et al., 2020). In a series of U.S. Census national representative samples of adults (ages 18 and older) from 2019 and April and May 2020, for instance, the period of the first rapid rise of the COVID-19 pandemic in the United States, Twenge and Joiner (2020) found adults were more than three times as likely to screen positive for depressive disorders, anxiety disorders, or one or both. In addition to the fear of contracting the disease, research has documented that factors such as economic uncertainty and loss of social support that can come with social distancing or quarantine, all are contributing to mental health challenges during this time (Brooks et al., 2020; Douglas et al., 2009; Sritharan & Sritharan, 2020).

Mental Health in Early Adults Attending College

For early adults attending college, the impacts of the pandemic on mental health may be expected to be particularly strong. Prior to the COVID-19 pandemic, there was evidence of worrisome generational changes in the mental health of college-aged undergraduate students (see Dvořáková, Greenberg & Roeser, 2018; Kadison & DiGeronimo, 2004; Xiao et al., 2017). Duffy, Twenge, and Joiner (2019), for instance, using a series of national tracking surveys aimed at assessing the general well-being and mental health of the US college undergraduate population, found evidence for significant generational cohort increases in symptoms of anxiety and depression from 2012 to 2018, prior to the pandemic. Furthermore, these trends are particularly pronounced among women, such that college-aged women are more vulnerable to

internalizing distress in the forms of anxiety and depressive symptoms than men (Auerbach et al., 2018). While research in China has demonstrated the deleterious impact of the pandemic on college attending early adults' mental health (Cao et al. 2020), few studies have been conducted in the U.S. on these issues.

Related to mental health are the behavioral and mental strategies that individuals use each day to cope with the pandemic. Adaptive coping strategies include keeping a daily routine, positive reframing of the situation, practicing mindfulness, and exercising (Shanahan et al., 2020; Sweeny et al., 2020). Maladaptive coping strategies include alcohol and drug use, extreme hopelessness, and negative religious coping (Lee, 2020). There is some indication that gender matters in coping among early adults. For example, a recent study found that women were more likely to report using emotional and social support, while men were more likely to use humor to cope (Eisenbarth, 2019). In addition, prior work suggests that in general, women tend to rely on more emotion-focused coping strategies (e.g., rumination; Eaton & Bradley, 2008), while men tend to utilize more problem-focused coping strategies (e.g., making a plan; Ptacek et al., 1994).

Although we are learning more about how college students are coping with the pandemic, studies suffer from methodological weaknesses. Some use only a 1-item measure to assess various coping strategies (Shanahan et al., 2020) and others employ general stress-coping measures that are not specifically about the pandemic (Liang et al., 2020; Wang et al., 2020), limiting our ability to understand the range of coping strategies young adults may use to cope with an unprecedented and pervasive stressor such as the COVID-19 pandemic.

Behavioral Compliance with Health Guidelines among Early Adults Attending College

The question of whether and which college-attending early adults will comply with health safety guidelines associated with reducing the spread of the virus has been raised by

developmental scientists (e.g., Steinberg, 2020) given the increased risk-taking characteristics of later adolescence and early adulthood (Steinberg, 2007). Indeed, studies in the USA show there is great variability in reported support of and compliance with CDCs behavioral guidelines (Czeisler et al., 2020), and this has been especially true as of late among young adults (Klutch, 2020). We need to know more about the individual difference and demographic factors that are associated with compliance with social distancing and mask-wearing guidelines (Bass et al., 2010; Goodwin, Gaines, Myers, & Neto, 2011; Harper, Satchell, Fido, & Latzman, 2020; Solomou & Constantinidou, 2020). A sense of invulnerability, coupled together with the asymptomatic spread of COVID-19, may lead to a failure to follow CDC guidelines on college campuses and continued congregation of students in large groups has spread the virus (Harper et al., 2020; Steinberg, 2020).

There is some indication that gender matters in complying with behavioral health guidelines as well. For example, two recent studies found that men were less likely to follow CDC guidelines for social distancing, mask-wearing, and hygiene behaviors (Heischer et al., 2020; Park et al., 2020). Given these differences, developing a further understanding of how individual differences such as mindfulness and compassion, may impact gender differences in adhering to CDC guidelines in college students is warranted.

In sum, we know relatively little about (a) changes in U.S. early adults' mental health during this period; (b) the antecedent factors that may impact early adults' mental health during the pandemic, and (c) the subsequent impacts of their mental health on their coping and compliance with behavioral health guidelines.

Study Aims

In this study, we focus on individual differences in male and female early adults' mindfulness and compassion as key antecedent factors to their mental health and behavioral compliance with health guidelines during the COVID-19 pandemic. Using data collected from college-attending early adults prospectively across two time points before and one time point during the pandemic, we examine both the direct and indirect impacts of early adults' mindfulness and compassion on their subsequent mental health, coping and behavioral compliance.

Figure 1. Theoretical Model

TIME 1 →	TIME 2 →	TIME 3 – PANDEMIC OUTCOMES
Individual Differences in Mindfulness and Compassion	Individual Differences in Mental Health	Individual Differences in Mental Health and Compliance During Pandemic

Theoretical Model

In this study, we draw on theoretical work which posits that individual differences in mindfulness and compassion skills are malleable antecedent factors affecting college students' mental health, coping, and behavioral choices (e.g., Dvořáková, Greenberg & Roeser, 2019). Mindfulness can be defined as “paying attention in a particular way on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994, p.4). Research has linked individual differences in dispositional mindfulness (DM) to fewer symptoms of anxiety and depression (Gómez-Odrizola, & Calvete, 2020), better emotion regulation and adaptive responses to stress (Ramasubramanian, 2017; Tomlinson et al., 2018; Weinstein, Brown, & Ryan, 2009), and better compliance with medication regimes (Fanning et al., 2018). Mediating processes such as improved attention and emotion regulation and changes in perspective on the self have been postulated to explain these mindfulness—wellbeing outcome linkages (e.g., Holzel et al., 2011).

Dispositional mindfulness has been associated with better daily coping. For example, in a set of four studies with college students, Weinstein & Ryan (2008) found that mindful individuals reported less frequent use of avoidant coping strategies, and in two of four studies, higher use of approach coping. Two studies of mindfulness training showed that training was associated with better coping and less stress during the pandemic (Lim et al., 2021; Zheng et al., 2020).

Dispositional mindfulness may also be associated with greater behavioral compliance with health guidelines. Greater awareness of both the personal health risks to oneself posed by the pandemic, as well as the threat we ourselves may pose to others, may be more likely among more mindful young adults. There is some evidence from past research that mindfulness is linked to greater compliance with health recommendations. For example, Lima et al. (2016), found that dispositional mindfulness mediated the relation between awareness of Alzheimer's Disease and medication adherence; and Fanning et al. (2016) found that dispositional mindfulness was associated with improved medication adherence in people with diabetes. Thus, it is possible that mindfulness might be associated with greater compliance with CDC guidelines for mitigating the spread of COVID-19 (e.g., hand-washing; wearing a face mask). In sum, we expect more mindful college students to show better subsequent mental health and compliance with health guidelines, during the pandemic.

Similarly, we believe that individual differences in empathic concern or compassion (Roeser, Colaianne & Greenberg, 2019) are important for understanding college students' mental health and health-related behavior during this period. Compassion is defined here as sensitivity to the suffering of others and a concomitant motivation to prevent or alleviate that suffering. In adults, compassion has also been linked to better mental health (Berking & Whitley, 2014;

Diedrich et al., 2017), better stress regulation (Lathren, Bluth, & Park, 2019), and prosocial behavior (e.g., compliance with community health guidelines) (Terry & Leary, 2011; Welp & Brown, 2014). However, less is known about what psychological processes might mediate these relationships.

Individual differences in compassion are also linked with daily coping. Greater compassion is associated with the use of adaptive coping strategies (e.g., active coping strategies) and lower use of maladaptive coping strategies (Sun et al., 2019), greater relationship focused coping (Kramer, 1993), and greater empathic self-efficacy, which itself is linked to better coping (Di Guinta et al., 2010).

While greater mindfulness may encourage people may comply with health guidelines due to awareness of the risk to ones' own health, another reason that individuals may comply with CDC recommendations is their level of compassion: their awareness and concern about how their own non-compliant behavior could negatively impact others by spreading COVID-19. This may be particularly pertinent for younger adults who may not view themselves as being particularly at risk of contracting COVID-19 (Park et al., 2020). In addition, compassion for others may create a heightened sense of social solidarity during the pandemic, which could, in turn motivate individuals to comply with CDC and other health recommendations (Roeser, Colaianne & Greenberg, 2018). In sum, based on previous work, we expect more compassionate college-attending young adults to show better subsequent mental health and compliance with health guidelines during the pandemic.

Summary and Research Questions

In the present study, we examined the impact of individual differences in college-attending early adults' mindfulness and compassion on their subsequent mental health, coping, and compliance with CDC guidelines using data from three waves of a prospective longitudinal study. Specifically, we address the following research questions:

Research Question 1. How do trait mindfulness and compassion (T1) impact subsequent mental health (T2 and T3) and daily coping and compliance with guidelines during the pandemic (T3)?

We made the following predictions:

Hypothesis 1. Mindfulness and Compassion (T1) will be linked to greater well-being and lower internalizing symptoms at subsequent timepoints (T2 and T3). -

Hypothesis 2. Greater Mindfulness and Compassion (T1) will be linked to greater adaptive coping and lower maladaptive coping during the COVID-19 pandemic (T3).

Hypothesis 3. Mindfulness and Compassion (T1) will be positively linked to greater compliance with CDC guidelines during the COVID-19 pandemic (T3).

Research Question 2. Do individual differences in mindfulness and compassion at Time 1 indirectly impact early adults' compliance with behavioral health guidelines during the Pandemic (Time 3) through their mental health (Time 2)? We hypothesized that:

Hypothesis 4. Greater well-being and lower internalized distress (T2) will mediate the relationship between mindfulness and compassion (T1) and coping (T3).

Hypothesis 5. Greater well-being and lower internalized distress (T2) will mediate the relationship between mindfulness and compassion (T1) and compliance (T3).

Method

Participants and Procedure

Participants ($N = 736$) were from two cohorts of college students who were control group participants in a longitudinal study that took place in Fall 2018 and Fall 2019. There were $n = 383$ participants who were in the 2018 cohort (52%), and $n = 353$ (48%) in the 2019 cohort. To examine our hypotheses about trait mindfulness and compassion predicting outcomes in the COVID-19 pandemic, we conducted a longitudinal follow-up assessment in May, 2020 to examine long-term impacts of baseline variables (e.g., mindfulness; compassion) on coping and compliance (e.g., self-reports of behavioral compliance with CDC recommendations to prevent spread of the pandemic).

Participants were contacted via email and offered the opportunity to participate in exchange for a \$10.00 Amazon gift card. Participants could then complete the study using an online survey that was hosted on the Qualtrics survey software platform. After providing consent, participants completed the measures below, in addition to follow-up measures for the original study. The relevant measures are reported below.

Measures

Individual Difference Measures

Mindfulness. Mindfulness was assessed using a 24-item version of the Five Facet Mindfulness Questionnaire (FFMQ-SF; Bohlmeijer et al. 2011) at Waves 1 and 2, and with a 15-item version of the FFMQ at Wave 3 (Abujaradeh et al., 2020). The 24-item version of the measure contains items across all five facets of mindfulness: acting with awareness, describing, observing, non-judgment, and non-reactivity (Baer et al. 2008), while the 15-item version omits the observe subscale. Respondents were asked to rate the extent to which each statement is true for them using a 5-point Likert-scale ranging from 1 = *Never or very rarely true* to 5 = *very often*

or always true. Items were summed to create a total score. Both versions of the FFMQ have shown high reliability in prior work (Abujeradeh et al., 2020; Bohlmeijer et al., 2011) and in the present study ($\alpha = .82, .84, .84$).

Compassion. Compassion was assessed with 6 items from the Empathic Concern subscale of the Interpersonal Reactivity Index (IRI; Davis, 1980) at Waves 1 and 2, while it was assessed 3 items taken from the IRI at Wave 3. Items (e.g., “I often have tender, concerned feelings for people less fortunate than me”) were rated from 1 = *does not describe me well* to 5 = *describes me very well*, and reliability was high across all three waves ($\alpha = .86, .89, .83$).

Internalizing Symptoms. Internalizing symptoms were indexed using a brief measures of depressive and anxious symptoms: Depressive symptoms were assessed using the patient health questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001), while anxious symptoms were assessed using the Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006). Depressive and anxious symptoms were available at all three waves of data collection for the 2018 cohort, and depressive and anxious symptoms were available at Waves 1 and Wave 3 for the 2019 cohort. However, only depressive symptoms (PHQ-9) were assessed at Wave 2 for the 2019 cohort. Factor analyses revealed that both depressive and anxious symptoms loaded on to a single factor at all three timepoints and cohorts. Accordingly, we summed responses to both PHQ-9 and GAD-7 to create a single, internalizing symptom score. Reliability was high at all three waves of data collection ($\alpha = .93, .95, .94$).

Well-being. Well-being was measured with the Pemberton Happiness Index (PHI; Hervaz & Vazquez, 2013). The PHI is an integrative measure that encompasses different domains of well-being. For the present study, the 11 items measuring the following domains were assessed: general, hedonic, eudemonic, and social. Participants used a 10-point Likert scale

(10 = *strong agreement*, 1 = *strong disagreement*) to indicate the degree of agreement with each statement. The scale has shown high internal reliability in past research (Hervaz & Vazquez, 2013) and in the present study ($\alpha = .92, .93, .93$).

Coping. Coping was measured using a modified version of the Brief COPE inventory (Carver et al., 1989). The Brief COPE Inventory was adapted by Carver (1997) and is an abbreviated version of the full COPE Inventory, a multi-dimensional inventory developed to assess the different coping strategies people use in response to stress. To increase reliability, we added one additional item from the original COPE to each of 12 coping subscales from the Brief COPE so that each subscale included 3 items. Participants rate their responses from 1 to 4 with 1 being '*I haven't been doing this at all*' and 4 being '*I've been doing this a lot*' in response to a modified stem from the Brief COPE that specified "We would like to know how you've been coping with the stress in your life *since you found out about the COVID-19 pandemic*." Factor analyses revealed a two-factor structure: 1) Adaptive coping (comprised of reappraisal, acceptance, planning, distraction, religious coping, active coping, and seeking social support for emotional and instrumental reasons) and 2) Maladaptive coping (comprised of substance use, denial, venting, and behavioral disengagement). Reliability analyses indicated both factors created a reliable index (all α 's $\geq .82$). Accordingly, the mean of each group of subscales comprising each factor was taken to compute an adaptive coping score and maladaptive coping score.

Compliance. Compliance with CDC guidelines for mitigating the impact of COVID-19 was assessed with 4 items that measured the frequency of self-reported behaviors in line with CDC guidelines over the past two weeks, including: hand-washing, wearing a mask, staying home and avoiding all social contact (reverse scored), and going out to public places. These

items were rated on a 7-point Likert scale from 1 = *Rarely* to 7 = *Frequently*. In addition, we assessed compliance with social isolation recommendations by assessing the number of time people attended in-person social gatherings (reverse), visited romantic partners that they do not live with (reverse), and visited family members they do not live with (reverse) over the past two weeks. Items were assessed on a scale from 0 = *not at all* to 5 = *Five times or more*. Given that the compliance items were measured on different scales, we used the percentage of maximum possible (POMP; Moeller, 2015) approach to create a composite score. Namely, we converted each item into a percentage of the maximum possible score by taking the raw score minus the minimum score (e.g., 1) and then dividing it by the possible scoring range (e.g., 6). Then, we used the converted POMP scores to create a composite by taking the average of all the POMP-scored items. Chronbach's alpha was .66.

Demographic characteristics. Students self-reported their sex, race, and grade level. Participants reported their sex as follows: female ($n = 540$; 73.4%), male ($n = 24.5\%$), non-binary/third gender ($n = 3$; 4%), and prefer to self-describe ($n = 4$; 5%). For analyses, we included sex as dichotomous a covariate, coded as 0 = male, 1 = female, given the low n of the remaining gender categories to draw meaningful comparisons. Participants self-reported their race as follows: African American / Black ($n = 29$; 3.9%), Asian or Pacific Islander ($n = 109$; 14.8%), Hispanic/Latina/o ($n = 22$; 3%), White/Caucasian ($n = 498$; 67.7%), American Indian or Alaskan Native ($n = 2$; 0.03%), multiracial ($n = 51$; 6.9%), prefer to self-describe ($n = 3$; 0.04%), and prefer not to say ($n = 5$; 0.07%). For analyses, to reduce model complexity, we coded race as a binary variable, where Black, Asian, Latinx, American Indian, and multiracial participants were coded as BIPOC (1) vs. White (0). Using this variable, there were $n = 498$ white participants (67.7%) while $n = 238$ (32.3%) were BIPOC. Participants reported their grade level

as follows: freshmen $n = 635$ (84.9%) sophomore $n = 36$ (4.9%), junior $n = 53$ (7.2%), senior $n = 21$ (2.3%) and other $n = 1$ (0.01%). Since the majority of participants were first-year students, we re-coded grade level as a binary variable indicating first-year stats (1; $n = 635$; 84.9%) vs. other years (0; $n = 111$; 15.1%).

Analytic Plan

To maximize statistical power (and avoid post hoc exclusions), all students who participated in the study were included in the analysis regardless of their degree of missing data. A total of 709 out of 736 (96.33%) of participants provided data for at least one key variable at T1; 453 (61.55%) students provided data for at least one variable at T2; and 279 students (37.36%) provided data for at least one key variable at T3. A total of 497 (67.52%) participants provided data for all variables during at least one assessment wave, whereas 271 (36.82%) participants provided data for all variables during all three assessment waves.

Participants who provided data for all variables during all three assessment waves did not differ significantly ($p < 0.05$) on mindfulness, empathic concern, internalizing, or well-being, or compared to participants who did not provide full data. Proportion of full data did not differ significantly ($p < 0.05$) by gender (women vs. men; $\chi^2(1) = 0.57$, $p = 0.47$) or race (White vs. other races/ethnicities; $\chi^2(1) = 0.97$, $p = 0.33$). Proportion of full data did differ significantly by first-year status (freshman vs. other years; $\chi^2(1) = 7.67$, $p < 0.01$), with first-year students being less likely to provide full data. Further, proportion of full data differed significantly by cohort ($\chi^2(1) = 11.87$, $p < 0.001$), with the 2018 cohort being less likely to provide full data.

All analyses were conducted using Mplus v6.12 (Muthén and Muthén 1998-2017), with the exception of alphas and tests of demographic differences among variables, which were conducted using SPSS v23 (IBM Corp 2015). Students with missing data were included in all

models by using full information maximum likelihood, which produces less biased estimates compared with conventional methods of dealing with missing data, such as listwise deletion (Schafer and Graham 2002). The sample for all analyses is 709. Model fit was assessed using common indices and their corresponding cutoffs, according to standard conventions (Schumacker and Lomax 2010). Values close to 0.90 or 0.95 for the comparative fit index (CFI) generally indicate good fit, and values of 0.05–0.08 for the root mean square error of approximation (RMSEA) generally indicate good fit. The main hypothesis that greater well-being and lower internalizing symptoms would mediate the associations between our independent variables (mindfulness and empathy) and dependent variables (coping and compliance) was tested using autoregressive, cross-lagged panel models with 5000 bootstrapped samples and bias-corrected confidence intervals. Mediation is inferred when the 95% bootstrapped confidence interval of the indirect effect does not include zero (Preacher and Kelley 2011); significance levels were set to $p < 0.05$. In a single model, cross-lagged paths were specified between the full mindfulness scores and compassion scores (independent variables), well-being and internalizing symptoms (mediators), and coping and compliance (dependent variables), which estimated prospective associations of one variable on the others. Wave-to-wave stability (autoregressive) paths and within-wave covariances among all variables were also included.

As discussed below, sex, cohort, freshman status, and race were also included as predictors of all T2 and T3 variables, and were allowed to covary with all T1 variables. To enhance parsimony and interpretability (and to reduce model complexity), a series of models were tested where cross-lagged paths (M2), autoregressive paths (M3), T2 and T3 residual covariances (M4), and their combination (M5), were constrained to be time-invariant. These

models were compared with a fully unconstrained baseline model (M1). Model comparisons were evaluated using chi-square difference tests, change in CFI, and change in RMSEA, where a non-significant chi-square difference test, $\Delta\text{CFI} \leq 0.01$, and $\Delta\text{RMSEA} \leq 0.015$ would indicate that the more restrictive model does not fit worse than the unrestricted model (Chen 2007). The more constrained (parsimonious) model was used if at least two of the three criteria were satisfied in a particular model comparison. All analyses used the maximum likelihood (ML) estimator, because the robust maximum likelihood estimator

Results

Descriptive Statistics and Bivariate Correlations

Table 1 shows estimated means and standard deviations (using FIML), alphas, and available n for all variables. Bivariate correlations among variables, shown in Table 2, were generally in the expected directions: at each assessment wave, mindfulness was related to greater well-being, $r_s = 0.49$ to 0.59 , higher levels of adaptive coping, $r_s = 0.16$ to 0.33 , lower internalizing symptoms, $r_s = -0.45$ to -0.58 , and lower maladaptive coping, $r_s = -0.29$ to -0.47 . Contrary to expectations, greater mindfulness was related to *lower* compliance, $r_s = -0.15$ to -0.22 . At each assessment wave, empathic concern was related to greater well-being, $r_s = 0.10$ to 0.27 , higher levels of adaptive coping, $r_s = 0.13$ to 0.27 , and greater compliance, $r_s = 0.17$ to 0.21 .

Demographic differences in variables were examined next (see Supplementary Materials for full results). Independent samples t -tests examining sex differences showed that women were higher compassion and internalizing symptoms at all waves. Further, women were higher on compliance at T3 than men ($t(272) = 2.53, p < .01$; Cohen's $d = .70$). There was also a small difference in mindfulness based on sex, such that men were slightly higher than women at all

waves; and in coping, such that women were higher on maladaptive coping compared to men. However, effects were small (Cohen's d 's = .01 to .03). No sex differences were found for well-being at any assessment wave. Next, results of independent samples t -tests for differences in cohort on all study variables revealed no significant cohort differences in any study variables at any assessment wave, with the exception of the 2018 cohort having slightly higher well-being at T1 compared to the 2019 cohort ($t(673) = 2.29, p < .05$; Cohen's $d = .02$). There were no significant grade level differences for any study variables at any assessment wave. Independent samples t -tests for racial differences in study variables revealed significant differences in compliance, such that BIPOC individuals were higher on compliance at T3 ($t(273) = 4.36, p < .01$; Cohen's $d = 1.84$). Further, there were significant racial differences in well-being at all three timepoints, such that BIPOC individuals were lower on well-being at all assessment waves (all t 's = 2.59 to 3.60; all p 's $< .01$; Cohen's $d = 0.07$ to 0.12). White individuals were also slightly higher than BIPOC individuals on mindfulness at T3 ($t(271) = 2.07, p < .05$; Cohen's $d = 0.04$). No racial differences were found for compassion, internalizing symptoms, or coping at any assessment wave. Given these differences, sex, cohort, and race were included as covariates. Although there were no grade level differences in study variables, we included freshman status as an additional covariate given prior literature suggesting that grade level may impact our variables of interest.

Autoregressive, Cross-Lagged Panel Model Mediation Analysis

Preliminary analysis revealed that each of the constrained models fit the data as well as the unconstrained model (see Table 3). Since the fully constrained model fit the data as well as the unconstrained model, for parsimony and interpretability, results are reported from the most constrained model (M5), in which the cross-lagged paths, autoregressive paths, and T2 and T3

within-wave residual covariances were time-invariant (T1 covariances were allowed to freely estimate). The final model (depicted graphically in Fig. 1) provided acceptable fit to the data: $\chi^2(50)=124.99, p < 0.05$, CFI=0.97, RMSEA = 0.05. The Supplementary Materials provide a complete reporting of the unstandardized path estimates, including 95% confidence intervals and p values. All autoregressive paths were significant, with standardized betas between 0.46 and 0.59, suggesting that each variable demonstrated cross-time stability.

Turning to the mediation analyses, mindfulness prospectively predicted greater well-being ($b = 0.63, p < .001$), holding constant prior levels of mindfulness, compassion, well-being, and internalizing symptoms, in addition to sex, grade level, cohort, and race. Levels of well-being in turn prospectively predicted greater adaptive coping ($b = 0.10, p < 0.01$), thus mediating the association between mindfulness and adaptive coping (unstandardized indirect effect = 0.06, 95% CI [0.026, 0.131]). In addition, mindfulness prospectively predicted lower internalizing symptoms ($b = -0.17, p < .01$), and internalizing symptoms, in turn, prospectively predicted maladaptive coping ($b = 0.17, p < .01$), thus mediating the association between mindfulness and maladaptive coping (unstandardized indirect effect = -0.029, 95% CI [-0.066, -0.008]). In addition, there was a significant indirect effect of well-being in the link between greater mindfulness and lower compliance (unstandardized indirect effect = -1.298, 95% CI -3.268, -0.202]).

Compassion prospectively predicted greater well-being ($b = 0.17, p < .05$), holding constant prior levels of mindfulness, empathic concern, well-being, and internalizing symptoms, in addition to sex, grade level, cohort, and race. Greater well-being, in turn, prospectively predicted greater adaptive coping, ($b = 0.10, p < 0.01$), thereby mediating the association between compassion and adaptive coping (unstandardized indirect effect = 0.17, 95% CI 0.002,

0.046]). Finally, there was a significant indirect effect of well-being on the link between greater compassion and greater compliance (unstandardized indirect effect = -0.387, 95% CI -1.181, -0.026]).

Discussion

The present study tested the hypothesis that mindfulness and compassion would prospectively predict coping and compliance during the COVID-19 pandemic. Furthermore, we tested several theorized mediators of these prospective relationships. Using longitudinal data from college-attending early adults collected over a year, results of autoregressive cross-lag panel mediation models revealed the mindfulness predicted more adaptive coping and lower maladaptive coping, and that these relationships were mediated by greater well-being and lower internalizing symptoms, respectively. Furthermore, mindfulness was linked with *less* compliance, and this was mediated by greater well-being. Finally, compassion was linked with greater adaptive coping and greater compliance, and these relationships were mediated by greater well-being.

Findings suggest that individual differences in mindfulness and compassion play an important role in college students' coping and compliance during the pandemic. Specifically, mindfulness may aid in self-regulation in terms of coping, while compassion may motivate individuals to regulate their own behavior in the interest of the greater good by following CDC guidelines. Results are aligned with prior findings on the impacts of mindfulness and compassion on coping and mental health, and add to the literature on the benefits of mindfulness and compassion in the COVID-19 pandemic in young adults (Lim et al., 2021; Zheng et al., 2020).

Furthermore, mindfulness was linked with greater well-being and lower internalizing symptoms at Time 2, which, in turn, mediated the links between mindfulness and coping,

suggesting that mindfulness may reduce distress and boost well-being, thereby enabling better coping in stressful situations at later timepoints. A similar mediation was found for the link between compassion and adaptive coping via well-being. Our study adds to the literature by demonstrating not only the effects of mindfulness and compassion on well-being and coping, but by elucidating their prospective relations, thereby demonstrating causal mechanisms in the links between mindfulness and coping during the pandemic.

As hypothesized, greater compassion was prospectively linked to greater compliance with CDC guidelines. Furthermore, this relationship was mediated through greater well-being at Time 2. However, the direction of the indirect effect was negative, whereas the direct effect between compassion and compliance was positive. This may be evidence of a suppressor effect of well-being on the empathic concern-compliance relationship. Suppressor variables are variables that improve the overall effect of the predictor(s) onto the criterion variable (MacKinnon et al., 2000). Therefore, as opposed to a mediating process, the significant indirect effect in this instance may suggest that by virtue of well-being's negative relationship to compliance, including well-being in the model improves the prediction of compassion on compliance. As such, additional research is needed to further disentangle these effects in order to better understand how compassion motivates compliance with CDC guidelines. Future work could examine additional mechanisms that may explain this relation. For example, greater compassion may lead to greater feelings of personal responsibility to protect others and prevent the spread of COVID-19, which could, in turn, lead to greater compliance.

Contrary to expectations, mindfulness negatively predicted compliance. This finding was unexpected, and yet, was consistent at all three waves of data collection. Furthermore, results of cross-lag mediation revealed that greater well-being at Time 2 mediated the effect of

mindfulness on lower compliance. There are several reasons that mindfulness may negatively predict compliance. First, in our autoregressive cross-lag panel models, we included empathic concern at each assessment wave. While mindfulness and empathic concern are separate constructs, they share considerable variation in past literature, as well as in the present study, with r s of .10 to .12. It is possible that our models co-vary out any portion of mindfulness that is linked with a prosocial orientation. However, accounting for the mediational effect through well-being, it is possible that during the developmental period of emerging adulthood (ages 18-25), while mindfulness may be linked to better mental health, it may paradoxically de-motivate prosociality due to greater well-being itself. For example, if young adults who are more mindful are less anxious about the pandemic, as evidenced by lower internalizing symptoms and higher well-being, that may lead to less concern about the pandemic and therefore lower compliance with guidelines. It is also possible that there are unmeasured third variables that may moderate this association. Given that findings of some meta-analyses show limited and conditional support for the prosocial effects of meditation (e.g., Kreplin, Farias, & Brazil, 2018), it would be important for future research to further explore this effect by examining potential moderators of this mediational link. For example, beliefs about personal responsibility for preventing the pandemic could be a potential moderator that should be tested in future work. Nevertheless, these unexpected findings may highlight that mindfulness may be a double-edged sword when it comes to young adults' behavior during the pandemic: on the one hand, mindfulness may increase well-being, lower internalizing symptoms, and increase adaptive coping, but on the other hand, mindfulness may lead to lower compliance.

Implications for College Students Behavior and Self-Regulation in the Pandemic

The findings of the present study have several important implications for understanding college students' mental health, coping, and compliance. First, results suggest that trait mindfulness may increase well-being, lower internalizing symptoms, and lead to better coping with the pandemic. It is well-known that college students have been suffering from declines in mental health overall (Bewick et al., 2010; Conley, Shapiro, Huguenel, & Kirsch, 2018) and that college mental health counseling centers are overburdened (Lipson, Lattie, & Eisenberg, 2019). As college campuses grapple with increasing demand during the COVID-19 pandemic, our results suggest that, if replicated, mindfulness interventions may be a fruitful avenue to pursue in terms of a preventive mental health intervention for college students during the pandemic. Given the success in terms of efficacy for group-based mindfulness interventions (El Morr et al., 2020; Felver et al., 2018; Harnett et al., 2010), particularly preventive interventions in school settings (Vidic & Cherup, 2019), mindfulness interventions may provide a cost-effective solution in terms of preventing mental health problems and boosting well-being and coping during the pandemic.

We also found that empathic concern was linked with *greater* compliance, while mindfulness was *negatively* linked to compliance. Accordingly, these results may suggest that, in addition to mindfulness interventions being potentially fruitful to boost well-being and coping, colleges should be aware of the potential iatrogenic effects of mindfulness training alone on impacting compliance with CDC guidelines. Instead, combining mindfulness training with compassion training aimed at increasing empathic concern in the COVID-19 pandemic may be necessary in order to affect both behavioral and mental health outcomes for college students.

Thus, a two-pronged approach to regulating young adults' behavior and mental health may be warranted that emphasizes mindfulness for *intrapersonal* effects of coping and mental

health, but also aims at affecting *interpersonal* outcomes of kindness and caring towards others in the interest of motivating prosocial behaviors like compliance with CDC guidelines.

Limitations

Our study presents with several strengths, including the use of a prospective longitudinal design, gathering data across three universities, and the use of autoregressive cross-lagged panel models that control for prior levels of our constructs of interest to test mediation. However, several limitations warrant mention.

First, while we had a large sample size of $N = 709$ initially, attrition resulted in a smaller sample of $N \sim 300$ for our third timepoint. While we were well-powered to detect effects given the number of parameters in our model, results should be replicated using larger samples in future work. Second, we used self-reports to measure compliance with CDC guidelines. While prior research suggests that self-reports of behavioral intentions do track well with actual health behaviors (Webb & Sheeran, 2006), there are limitations to this approach in that actual behavior is not measured, but inferred from self-reports. Thus, future research could examine behaviors in observational studies to circumvent these problems. Third, the sample was relatively homogenous in terms of race, being comprised primarily of White individuals. While we included race as a covariate in all of our analyses, the sample of BIPOC individuals was not large enough to conduct a multiple group CLPM, limiting our ability to examine any racial differences that may exist in the pattern indirect effects in our study. Finally, we made use of two cohorts of data that had different baseline timepoints, which could have impacted our findings. However, given that t-tests revealed few (if any) differences between cohorts on key variables of interest, and we also included cohort as a covariate in all our models to control for any potential differences between cohorts.

Limitations notwithstanding, our study presents a novel analysis of antecedents of coping and compliance in a young adult population, and provides important information regarding the benefits of mindfulness and empathic concern young adults', while also highlighting some potential downsides to being more mindful without being compassionate in a pandemic situation.

Conclusion

Using data collected from college-attending early adults prospectively across two time points before and one time point during the pandemic, we examined both the direct and indirect impacts of early adults' mindfulness and empathic concern on their subsequent mental health, coping and compliance and tested whether young adults who are more mindful and compassionate, will show less distress and greater wellbeing, which in turn will be associated with greater coping and behavioral compliance with the COVID-19 pandemic. Together, findings suggest that individual differences in mindfulness and compassion act in important, but different ways to impact regulation in the pandemic, and point to potential intervention targets to help mitigate both the mental health and physical health risks of the COVID-19 pandemic.

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Table 1

Descriptive statistics and reliabilities for all study variables (N = 739)

Variables	<i>M</i>	<i>SD</i>	<i>n</i>	α
Mindfulness T1	3.11	0.54	709	0.84
Mindfulness T2	3.16	0.57	453	0.86
Mindfulness T3	3.21	0.67	273	0.84
Empathic Concern T1	3.95	0.65	684	0.86
Empathic Concern T2	3.99	0.70	447	0.89
Empathic Concern T3	4.20	0.80	271	0.83
Internalizing T1	1.91	0.67	687	0.93
Internalizing T2	2.02	0.73	447	0.95
Internalizing T3	1.96	0.71	271	0.94
Well-Being T1	7.21	1.59	675	0.92
Well-Being T2	7.19	1.59	447	0.93
Well-Being T3	7.16	1.64	271	0.93
Adaptive Coping T3	2.65	0.52	276	0.89
Maladaptive Coping T3	1.88	0.45	276	0.83
Compliance T3	78.38	15.75	275	0.66

Notes: T1 = Time 1, T2 = Time 2, T3 = Time 3

Tables 2

Bivariate Correlations among all Study Variables (N = 739)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Mindfulness T1														
2. Empathic Concern T1	0.10													
3. Internalizing T1	-0.58	-0.03												
4. Well-being T1	0.59	0.27	-0.62											
5. Mindfulness T2	0.67	0.09	-0.49	0.51										
6. Empathic Concern T2	0.12	0.58	0.01	0.16	0.07									
7. Internalizing T2	-0.45	0.02	0.62	-0.41	-0.62	0.06								
8. Well-being T2	0.53	0.20	-0.51	0.63	0.65	0.24	-0.60							
9. Mindfulness T3	0.57	-0.07	-0.48	0.48	0.66	-0.06	-0.48	0.48						
10. Empathic Concern T3	-0.02	0.39	0.13	0.08	-0.09	0.40	0.25	-0.03	-0.07					
11. Internalizing T3	-0.47	0.06	0.55	-0.46	-0.51	0.09	0.63	-0.39	-0.64	0.20				
12. Well-being T3	0.49	0.10	-0.42	0.68	0.51	0.14	-0.40	0.64	0.57	0.17	-0.61			
13. Adaptive Coping T3	0.16	0.13	-0.13	0.36	0.33	0.27	-0.14	0.40	0.21	0.26	-0.12	0.43		
14. Maladaptive Coping T3	-0.31	0.12	0.39	-0.22	-0.29	0.10	0.37	-0.20	-0.47	0.12	0.60	-0.30	0.07	
15. Compliance T3	-0.15	0.21	0.06	-0.09	-0.22	0.17	0.20	-0.25	-0.15	0.18	0.09	-0.12	0.10	0.04

Notes: T1 = Time 1, T2 = Time 2, T3 = Time 3; Bolded values are significant at $p < .05$

Table 3

Fit Indices and Model Comparisons for the Cross-Lagged Panel Model (N = 736)

Model (M)	Model Fit Indices				Model Comparisons	Model Fit Comparisons				
	χ^2	df	RMSEA	CFI		$\Delta\chi^2$	Δdf	p	Δ RMSEA	Δ CFI
M1: baseline	88.91	28	0.05	0.97						
M2: time-invariant cross-lagged paths	112.26	40	0.05	0.97	M1 vs M2	23.35	12	0.02	0.000	0.000
M3: time-invariant autoregressive paths	94.223	32	0.05	0.97	M1 vs M3	5.313	4	< .001	0.000	0.000
M4: time-invariant residual covariances	94.71	34	0.05	0.97	M1 vs M4	5.8	6	0.45	0.000	0.000
M5: M2 + M3 + M4	124.99	50	0.05	0.97	M1 vs M5	36.08	22	0.03	0.000	0.000

Notes. χ^2 = chi-square; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; Δ = change in parameter. Gender and cohort were included as covariates.

Figure 1. Autoregressive, cross-lagged panel model. Cross-lagged paths, autoregressive paths, and T2 and T3 within-wave residual covariances were constrained to be time-invariant (T1 covariances were freely estimated). Within-wave covariances and covariates of race, sex, first-year status, and cohort were included (but are not displayed to ease presentation). MIN = mindfulness, EMP = Empathic Concern, INT = internalizing, WB = Well-being, AC = adaptive coping, MC = maladaptive coping, and COM = compliance. T1, T2, and T3 represent assessment waves one, two, and three, respectively. Solid lines represent paths that are significant at the $p < .05$ level; Dotted lines represent nonsignificant paths. Bolded lines represent a significant indirect effect.