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EXAMINING THE RELATIONSHIP BETWEEN MENTAL HEALTH CONDITIONS AND
RISK PERCEPTION IN DETERMINING COVID-19 PREVENTATIVE HEALTH
BEHAVIORS

by

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A thesis submitted in partial fulfillment of the requirements
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ABSTRACT

Depression and anxiety are relatively common among college students and research suggests that risk perceptions may be modulated by these mental health conditions. In addition, studies have demonstrated that higher perception of risk predicts more frequent practice of preventative health behaviors, and this relationship may also be modulated by depression and anxiety. The present study examined the relationship between these factors in the context of COVID-19. Using survey data from undergraduate students, risk perceptions about COVID-19, self-reported practice of COVID-19 preventative behaviors, and their relationship were compared between those with and without the common mental health conditions of Major Depressive Disorder and Generalized Anxiety Disorder. Results indicated that risk perceptions predicted self-reported use of preventative health behaviors across groups, and those with MDD and/or GAD had relatively greater affective than cognitive risk perceptions related to COVID-19. Critically, however, those with MDD and/or GAD did not show enhanced self-reported use of preventative health behaviors to avoid contracting or spreading COVID-19. In addition, mental health condition status did not modulate the relationship between risk perception and preventative health behaviors. Together, these findings suggest that while affective risk perceptions related to COVID-19 may be elevated in college students with common mental health conditions, perceived risk does not translate into behaviors that will reduce their risk of contracting or spreading COVID-19.

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INTRODUCTION

As of September 30th, 2020, over 206,000 Americans have died as a result of COVID-19 (New York Times, 2020). Young adults (age 18 to 34 years) continue to find themselves in the middle of a contentious debate regarding who is at risk of contracting COVID-19. Recent research has found that in a sample of young adults hospitalized for COVID-19, “21% required intensive care, 10% required mechanical ventilation, and 2.7% died” (Cunningham et al., 2020). In a nation where there are on average 100,000 new cases of COVID-19 a day (New York Times, 2020), those numbers provide a startling outlook for the overall health of young adults as we near the end of 2020.

The Center for Disease Control and Prevention (CDC) recommends that young adults wear masks when outside their home and wash their hands often with warm soapy water for at least 20 seconds in order to prevent the spread of coronavirus (Center for Disease Control and Prevention, 2020). However, despite these precautions, many college students have brought COVID-19 back with them to universities across the nation, prompting closures and transitions to remote learning (Irrera & Stecklow, 2020). In addition, recent research has indicated that COVID-19 has led to increasing levels of depression potentially adding an additional barrier for adults to protect themselves (Abdalla, Cohen, & Ettman, 2020). Even before the pandemic, it was estimated that 13% of young adults experienced Major Depressive Disorder (MDD) and 2% experienced Generalized Anxiety Disorder (GAD) (National Institute of Mental Health, 2019). Therefore, identifying differences in behavior patterns between young adults with and without MDD or GAD could help universities and policy makers better address this specific population’s needs when attempting to curb the effects of the pandemic.

Now as the United States faces a new onslaught of coronavirus cases, researchers can begin to understand the mechanisms – both social and biological – that influence the disease’s spread. In particular, research on the factors that influence individual responses to COVID-19 can be guided by psychological research on risk perception and the way that these perceptions influence a person’s outward behavior (Slovic & Peters, 2006). The current study takes this approach, using an analysis of risk perception to determine what mechanisms may influence young adults with mental health conditions of MDD and GAD to adopt certain protective measures against COVID-19.

Risk Perception Analysis and Health Related Behaviors

COVID-19 has presented the United States with a health crisis with the potential to affect every individual in the country. This pandemic presents immediate health risks to many individuals, necessitating the exploration of health-related behaviors in response to the outbreak.

One recent development in the study of risk perception as it pertains to health-related behaviors is the Tripart Model of Risk Perception (TRIRISK) which looks at deliberative, affective, and experiential risk (Ferrer, Klein, Persoski, Avishai-Yitshak, & Sheeran, 2016). The first (deliberative) are judgements of probability based on reason and are most frequently cited in health behavior theories (Ferrer, et al., 2016; Ferrer, Klein, Avishai, Jones, Villegas, & Sheeran, 2018). The second (affective) measures whether feelings associated with the threat are positive-negative and high-low (Ferrer, et al., 2018; Ferrer, et al., 2016). Last, experiential risk perception involves “gut-level reactions” rather than logical or affective responses (Ferrer, et al., 2016). Affective risk perception is most often measured with reports of worry, anxiety, and fear. Deliberative, also referred to as cognitive, risk perception and affective risk perception can both

be assessed in order to form a more complete picture of decision making processes in individuals (Ding, Du, Li, Liu, Tan, Zhang, & Zhang, 2020). Previous research has linked all three of these types of risk perception to changes in health behavior (Ferrer, et al., 2016). However, outside of the original study identifying it previous research has not established a valid measure of experiential risk perception. In relation to COVID-19, reliable measures for both affective and cognitive risk perception have been established (Ding, et al., 2020). Ultimately, affective risk perception is the strongest predictor of protective health behavior, as found by most previous work (Ferrer, et al., 2018). The present study will investigate both affective and cognitive risk perception as both are related to health behaviors.

The COVID-19 pandemic has often been compared to the severe acute respiratory syndrome (SARS) outbreak in the early 2000s (Castelli, Go, Hamer, Koopmans, Petersen, & Petrosillo, 2020). Previous research involving other respiratory illnesses such as measles demonstrated relationships between perceptions of risk and health behaviors. For example, one study found that mothers who feared the potential effects of the virus itself were more likely to vaccinate their children than those who feared the unknown potential effects of vaccinations (Bond & Nolan, 2011). With the contagious nature of COVID-19 known, individuals can then alter their own actions in response to perceived risk of catching the virus. According to previous research, this perception of risk is a key predictor of whether or not individuals will take protective action for their health and follow through on taking such actions (Ferrer, et al., 2018; Ferrer, et al., 2016; Smith, 2006).

Risk Perception Analysis and COVID-19

At this point, the COVID-19 pandemic has been affecting the world for all of 2020 and 2021 thus far. As such, various pieces of research have been published tentatively exploring the relationship between risk perception and COVID-19. One study investigating the perceived risk of COVID-19 infection among a German population found that 29.5% of participants believed they will be infected at some point in general (Gerhold, 2020). The same study also found that 62.1% of respondents agreed that they were generally worried about COVID-19 (Gerhold, 2020). Another group of researchers analyzed risk perception of COVID-19 across 10 different countries to get an idea of potential predictors for higher risk perception. On top of finding that overall risk perception was uniformly high, they also identified variables such as prosocial versus idealistic values and direct personal experience as strong positive predictors of high levels of risk perception (Dryhurst, Schneider, Kerr, Freeman, Spiegelhalter, van der Liden, van der Bles, & Recchia, 2020).

In the context of young adults, a study conducted with Chinese college students found that female students and those with higher knowledge levels displayed higher risk perception than others (Ding, et al., 2020). Young adults are increasingly becoming infected with COVID-19 meriting further investigation into their motivation for engaging in health behaviors. One potential motivation could be negative emotions, as explored by Qian and Li who found a positive correlation between risk perception of COVID-19 and negative emotions in their Chinese population (Qian & Li, 2020). The present study hopes to add to the body of literature above in order to establish clear relationships with risk perception in the context of COVID-19.

Risk Perception Analysis and Mental Health Conditions

Limited research has been conducted regarding the relationship between mental health conditions and risk perception, however studies have generally found that individuals with anxiety display higher levels of risk perception overall while individuals with depression tend to display higher levels of affective risk perception and lower levels of cognitive risk perception. Recent research, however, found that adolescents with negative affect reported less perception of risk when compared to others (Curry & Youngblade, 2006). The current study focuses on mental health conditions, specifically MDD and GAD, for both of which there exists a small body of pre-existing research relating to their effects on risk perception.

Anxiety

Previous research on the relationship between anxiety and risk perception has consistently found that anxious individuals generally perceive higher levels of risk. A study by Kallmen (2000) found that anxious individuals were more likely to perceive higher personal and general risk than self-confident individuals. The most cited study investigating anxiety and risk perception found that individuals with trait anxiety reported increased perceived risk of all referred negative events (Butler & Mathews, 1987). Their distinction between anticipatory and trait anxiety leads to a better understanding of risk perception for clinically anxious individuals.

Besides the study by Butler and Mathews cited above, there has been little research on the relationship between clinical anxiety and risk perception. There have been many studies investigating the effects of induced anxiety on risk perception (Morrison, Kim, Rimal, & Turner, 2006; Butler & Mathews, 1987; Mavondo & Reisinger, 2005) or anxiety of health consequences (Evans, Howell, Hopwood, Lalloo, & Shenton, 2001; Murakami, Kashiwazaki, & Takebayashi,

2020). These studies have shown that individuals with clinical levels of anxiety are more likely overestimate health related risks than those with normal levels of anxiety. However, there has been little investigation into the relationship between perception of health risks and clinical anxiety. The current study aims to help address this gap by assessing affective risk perception, cognitive risk perception, and GAD.

Depression

A much larger pool of literature exists investigating the relationship between depression and risk perception (Isen, Means, Nowicki, & Patrick, 1982; Murakami, Kashiwazaki, & Takebayashi, 2020; Pietromonaco & Rook, 1987). For example, in a pioneering study by Pietromonaco and Rook (1987), risk perceptions contributed more to decision making in depressed individuals but did not necessarily lead to the practice of specific behaviors. This study is built upon previous research that suggests differential perceptions of risk lead to different behavior choices in happy versus sad subjects (Isen, Means, Nowicki, & Patrick, 1982). Pietromonaco and Rook (1987) also found that risk perception contributed more to the decision making style of depressed individuals only when their thoughts were focused on themselves, not another person. This finding could lead to different relationships between risk perception and related health behaviors in participants with MDD, which the present study investigates.

In relation to COVID-19, at least one study has been conducted investigating the link between depression and perception of risk relating to the virus (Ding, et al., 2020), though most are centered around the impact of the pandemic on mental health conditions (Abdalla, Cohen, & Ettman, 2020; Barzilay, et al., 2020; Rehman, et al., 2020). This study identified a positive relationship between depression and affective risk perception, but a negative relationship

between depression and cognitive/descriptive risk perception. With this, Ding et al. (2020) reaffirm the importance of testing both forms of risk perception separately in the context of COVID-19. In addition, this study did not look at the relationship between risk perception and health behaviors, as it only focused on risk perception and depression in the context of COVID-19. The current study investigates the relationship between all three.

Health Behaviors

The previous research above indicates why mental health conditions may be related to risk perception and suggests that these perceptions of risk may alter health behaviors, but the current study also investigates whether young adults with mental health conditions follow through with the preventative health behaviors they intend to implement. While no studies have analyzed this question in the context of COVID-19, there exists a general consensus from research on the implementation of health behaviors in individuals with depression. For instance, a 2005 analysis found that the likelihood of a depressed patient continuing to take antidepressants after the first three months dropped by nearly 30% over the next three months (Solberg, Trangle, & Wineman, 2005). Another study found that individuals with depression were less likely to receive annual eye exams or a flu shot annually (Egede, Ellis, & Grubaugh, 2009). These studies, taken with the literature above on mental health conditions and risk perception indicate a disconnect between risk perception and preventative health behaviors, such that enhanced risk perception (generally, or about health specifically) does not lead to greater action towards reducing health risks in those with anxiety and depression.

Previous literature also finds similar results from individuals with anxiety disorders (Otto & Smits, 2018; Balluz, Berry, Gonzalez, Mokdad, & Strine, 2008; Balluz, Chapman, Kobau, &

Strine, 2005). Correspondingly, one study found that individuals with consistent anxiety symptoms were more likely than those without to smoke, be obese, be physically inactive, and to drink heavily (Balluz, Chapman, Kobau, & Strine, 2005). However, another study found that while students with symptoms of depression frequently displayed poor health behaviors, those with symptoms of anxiety did not (Lane, Lovell, Nash, & Sharman, 2015).

Earlier it was concluded that individuals with depression and anxiety experience higher levels of risk perception, and that individuals with higher levels of risk perception exhibit better practice of health-related behaviors. However, additional research suggests that individuals with depression or anxiety are actually worse at practicing health-related behaviors. The current study aims to investigate this supposed contradiction in the context of COVID-19.

The Present Study

The primary purpose of this study is to determine how the common mental health conditions of MDD and GAD affect the relationship between risk perception and health behaviors, specifically: 1) Will young adults with MDD and/or GAD display higher levels of risk perception for COVID-19? 2) Will young adults with MDD and/or GAD be less likely to follow through on plans to use COVID-19 prevention behaviors (e.g. wearing a mask)? The following hypotheses were generated:

Hypothesis 1: Individuals with MDD and/or GAD will have greater risk perception of COVID-19.

Hypothesis 2: Individuals with MDD and/or GAD will be less likely to implement preventative behaviors related to COVID-19.

Hypothesis 3: Individuals with MDD and/or GAD will have a reduced relationship between risk perception and preventative health behaviors.

Potential exploratory analysis examine:

Whether individuals with MDD and/or GAD will be less likely to follow through on their plans to implement preventative behaviors related to COVID-19 (i.e., self-predicted implementation of health behaviors vs. actual implementation of health behaviors).

METHOD

Participants

A power analysis was conducted using the effect size of Pietromonaco and Rook's data ($d=0.6625$) yielding the recommendation of 37 participants per group (with MDD and/or GAD, no MDD or GAD) (Pietromonaco & Rook, 1987). For the first administration of the study, 226 participants of varied backgrounds took part, and 182 participants completed the follow-up study as well. The sample was 85% female, 13% male, and 2% individuals did not identify as strictly male or strictly female.

Participants were all over the age of 18 and currently enrolled at the University of Central Florida. Participants were recruited through the Psychology Department's SONA website where students are able to seek online studies that they can complete when available as well as through 3 classes within the Psychology department at the University of Central Florida. Participants were given 1 credit point through SONA for their participation or extra credit depending on their recruitment. Every participant gave informed consent to participate in the study.

Based on the clinical measures used, 167 participants' scores classified them as having at least one mental health condition (MDD or GAD) and 59 participants were classified as having neither (Table 1). This distribution meets the threshold established by the power analysis of 37 participants per group. Out of the 167 participants with at least one of the assessed mental health conditions, 41 exhibited only depression, 27 exhibited only anxiety, and 99 exhibited both, making this last group the largest. In addition, females composed 85% of the study population, with 74% of females exhibiting at least one of the two assessed mental health conditions.

Measures

Scales to measure affective and cognitive risk perception. Due to its specificity and previous use for the topic of COVID-19, this study uses the scales for affective and cognitive risk developed by Ding et al. based on the earlier research of Ferrer and colleagues (Ding, et al., 2020; Ferrer, et al., 2016). The Cronbach's alpha coefficient for the affective risk perception (ARP) scale is 0.842 and for the cognitive risk perception (CRP) scale it is 0.891. These scales are included in Appendix A.

Preventative behaviors. In order to best measure the implementation of preventative behavior by participants the scale adapted from CDC guidelines by Hu and colleges was used (Hu, Mei, Niu, Tang, & Wang, 2020). The questionnaire asks participants to rank on 5-point Likert scale (1=not at all, 5=very frequently) their frequency of engaging in the following behaviors: "wearing masks," "washing hands," "sanitizing clothes or other items," "sneezing in to their elbows," and "staying at home" ($\alpha=.72$) (Hu, Mei, Niu, Tang, & Wang, 2020). This scale is included in Appendix B.

Mental health conditions. Participants were asked to both indicate whether or not they had been formally diagnosed with depression and or anxiety disorders prior to January of 2020 and complete the short-form version of the Depression Anxiety Stress Scales (DASS-21) (Crawford & Henry, 2005; Lovibond & Lovibond, 1995; Szabó, 20010). The short version has been shown to validly measure the dimensions of depression, anxiety, and stress (Crawford & Henry, 2005). The clinical scoring guidelines will be used to classify participants as either exhibiting a mental health condition (MDD and/or GAD) or belonging to the control group (neither MDD or GAD). The authors of the inventory have found through comparisons of the short and long forms of the

DASS "that the values of the full version [of the DASS-21] are very similar to the values obtained from doubling the scores on the short form of the DASS-21" (Lovibond & Lovibond, 1995). Since the short version of the inventory is being used for this study, scores will be doubled in order to properly match the classifications. This scale is included in Appendix C.

Demographic Scale. In order to collect basic demographic information about the participants a background questionnaire will be administered. This will include questions about the participant's age, major, education level, ethnicity, sex, and gender. This scale is included in Appendix D.

Procedure

Participants were informed they were going to take part in a research study involving mental health conditions and COVID-19. This study was available online only through Qualtrics where participants completed an online survey assessing mental health conditions, COVID-19 risk perception, and planned use of COVID-19 prevention behaviors. 182 participants also completed a follow-up study after one week indicating whether their plans to use preventative behaviors were implemented to measure actual behavior. This second survey consisted of the exact same measures with a change in phrasing to ask how often they *did* utilize the preventative behaviors.

Statistical Analysis

Composite risk perception and preventative health behavior values were made for each participant as each of these variables included multiple measures. First, a proportional value was calculated by dividing each participant's response to individual measures by the highest possible score on that measure. These proportion values were then averaged across measures of the same

variable (e.g., affective and cognitive risk perception averaged to yield a risk perception composite score). This process adjusted all of the individual measures and composite variables to be on the same scale (i.e., 0-1) since some contained more questions or possible responses than others and would otherwise be unequally weighted in composite scores. The first two hypotheses were addressed using two-sample independent t-tests in order to compare the means of both risk perception and preventative health behaviors in the populations with and without mental health conditions. The third hypothesis was tested using a hierarchical linear regression of preventative health behaviors at Time 1 with risk perception and presence of a mental health condition at Time 1 as a predictor at the first level the interaction of mental health condition and risk perception as predictors at the second level. For the planned exploratory analysis, we calculated the difference between predicted health behaviors at Time 1 from actual health behaviors at Time 2 and conducted a two-sample t-test in order to determine whether there were differences in that discrepancy measure between those with mental health conditions and those without. Means are reported with their standard errors (SEM).

RESULTS

Hypothesis 1 was tested using a two-sample t-test to compare risk perception of COVID-19 between participants with mental health conditions of anxiety or depression and those without. A two-tailed t-test for independent samples was conducted in which the 167 participants in the mental health condition group ($M = 0.71$, $SEM = 0.01$) compared to the 59 participants in the control group ($M = 0.72$, $SEM = 0.02$) did not differ significantly in their self-reported levels of perception of risk related to COVID-19, $t(97) = 0.73$ $p = .47$. Therefore, there is insufficient evidence to conclude that a difference between the average risk perception of those with mental health conditions differs from those without mental health conditions.

However, due to literature demonstrating differences in the relationship between affective and cognitive risk perception, specifically in the context of health behaviors (Avishai, et al., 2018; Ferrer R. , et al., 2018), a post-hoc test was conducted to determine whether participants in the group with GAD and/or MDD differed in levels of affective versus cognitive risk perception compared to those who had neither GAD nor MDD. Results of a repeated-measures ANOVA with mental health (GAD and/or MDD vs control) group as a between-subject factor and risk perception type as a within-subject factor yielded a significant interaction of group and risk perception type, $F(1,224) = 30.04$ $p = <.001$. Consistent with the literature, inspection of means indicated that those in the mental health condition group had relatively higher levels of affective risk perception ($M = 0.79$, $SEM = 0.01$) compared with cognitive risk perception ($M = 0.62$, $SEM = 0.02$). In contrast, those who did not have MDD or GAD had relatively higher levels of cognitive risk perception ($M = 0.75$, $SEM = 0.03$) compared with affective risk perception ($M = 0.70$, $SEM = 0.02$). The main effect of risk perception types was significant, $F(1,224) = 8.65$, p

= .004, indicating higher means in affective ($M = 0.74$, $SEM = 0.01$) versus cognitive risk perception ($M = 0.68$, $SEM = 0.02$) across groups. Consistent with the prior t-test, there was no main effect of group on risk perception across types, $F(1,224) = 0.56$, $p = .46$.

For Hypothesis 2 a two-tailed two-sample t-test was conducted to compare preventative health behaviors between groups. There was no significant effect of mental health group on preventative health behaviors relating to COVID-19, $t(90) = -0.88$, $p = 0.38$, with both groups showing relatively high levels of self-reported preventative health behaviors (mental health group $M = 0.78$, $SEM = 0.01$; control group $M = 0.75$, $SEM = 0.02$). Thus, there is insufficient evidence to conclude that the presence of MDD and/or GAD has a significant effect on the use of preventative health behaviors to avoid contracting COVID-19. Post-hoc testing revealed no differences in self-reported health behaviors between those with only depression versus only anxiety, $t(63) = -0.19$, $p = 0.85$.

For Hypothesis 3, a linear regression was conducted to predict preventative health behaviors based on the risk perception, presence of a mental health condition, and their interaction (Table 2). A significant regression equation was found, $F(3,222) = 11.24$, $p < .001$, with an R^2 of 0.13, at Time 1. However, only risk perception was a significant predictor of preventative health behavior at Time 1 ($r = 0.35$, $p < .001$). Neither the main effect of mental health condition ($r = 0.06$, $p = .20$) in the first step of the model, nor the interaction between presence of mental health condition and risk perception ($r = 0.14$, $p = .29$) at the second step, were significant. Correspondingly, the addition of the risk perception-group interaction to the model did not significantly improve the model fit ($\Delta R^2 = .008$, $p = 0.29$).

As the groups differed in their levels of affective versus cognitive risk perception, the above hierarchical regression was repeated in post-hoc tests that separately assessed effects of affective versus cognitive risk perception on preventative health behaviors. A significant regression equation was again found for both affective risk perception (Table 3), $F(3,222) = 6.70$, $p < .001$, and cognitive risk perception (Table 4), $F(3,222) = 4.05$, $p = .007$, at Time 1. Consistent with the hierarchical model including the composite risk perception model, these separate post-hoc models revealed only main effects of affective risk perception ($r = 0.28$, $p = .002$) and cognitive risk perception ($r = 0.19$, $p = .045$) on preventative health behaviors. Just like in the first model, there were no main effects of mental health condition (Table 4) and the addition of the interaction term between affective risk perception and mental health conditions ($\Delta R^2 = .003$, $p = .41$), as well as the addition of the interaction term between cognitive risk perception and mental health conditions ($\Delta R^2 = .001$, $p = .65$) did not significantly improve these separate post-hoc models.

Finally, in the planned exploratory analysis, a two-sample t-test was used to calculate the difference between predicted health behaviors at Time 1 from actual health behaviors at Time 2. There was no significant group effect on following through with predicted COVID-19 preventative behaviors after 1 week, $t(76) = -0.72$, $p = .48$. Notably, there was very little discrepancy in predictions and actual self-reported preventative health behaviors across 1 week, in both groups (mental health group $M = 0.01$, $SEM = 0.01$; control group $M = 0.02$, $SEM = 0.01$). Thus, mental health condition status did not appear to impact implementing planned behaviors to reduce contracting COVID-19, but a lack of discrepancies might have impacted our abilities to observe a group difference.

DISCUSSION

The current study examined the effects of the presence of common mental health conditions of MDD and GAD on both risk perception and preventative behaviors of COVID-19 among college students. Results indicated that presence of MDD and/or GAD did not influence preventative health behavior or overall perception of risk relating to COVID-19. Further investigation revealed greater affective than cognitive risk perception among those with MDD and/or GAD, but mental health condition status still did not modulate the relationship between specific measures of risk perception and preventative health behaviors. This finding is consistent with research demonstrating that affective risk perception is more closely related to feelings of threat, while cognitive risk perception is more often used in theories of health (Ferrer, et al., 2018; Ferrer, et al., 2016). This literature taken with the current results indicates that elevated affective risk perception among those with mental health conditions does not appear to motivate action toward healthy behaviors.

Notably, compared to those without MDD or GAD, those with MDD and/or GAD displayed relatively higher levels of affective risk perception *and* lower levels of cognitive risk perception. This inverse relationship helps to explain the lack of relationship between overall risk perception related to COVID-19 and in those with MDD and/or GAD predicted in Hypothesis 1. This outcome is also in line with the findings of Ding and colleagues (2020) in their conclusion that mental health conditions and risk perception are closely linked in the context of COVID-19, as neither was elevated in the mental health condition group.

While Ding et al. focused only on depression, the current study included measures for the detection of GAD as well, a factor that may have enhanced levels of risk perception within the

mental health condition group as anxious individuals are known to perceive more risk than others (Kallmen, 2000). However, by measuring only MDD and GAD, the present study is unable to generally conclude a pattern for all individuals who suffer from anxiety or depression symptoms. Indeed, a limitation of the current study is that individuals with other mental health conditions may have been included in the control group. To address this, future research should be directed at investigating perception of risk, practice of preventative behaviors, and their relationship in individuals with other mental health conditions – including additional disorders with depression and anxiety symptoms (e.g., Dysthymia and Post Traumatic Stress Disorder, respectively).

With respect to predictors of preventative health behaviors, although no significant group differences were found, the finding that risk perception is related to preventative health behaviors supports previous findings in the context of viral pandemics (Liao, Cowling, & Lam, 2014; Ferrer, et al., 2016). Previous research has also indicated that a relationship may exist between the stage of the pandemic and which type of risk perception serves as a better predictor of preventative behaviors (Liao, Cowling, & Lam, 2014). The findings of this study's exploratory analysis demonstrates that even a year into the pandemic, affective risk perception remains a strong predictor of health behaviors, regardless of the presence of a mental health condition. Liao, Cowling, and Lam (2014) predicted that cognitive risk perception would have a greater influence on preventative health behaviors later in the course of the pandemic, however those findings are not supported by this study. Yet, without data from the onset of the pandemic for this population, this study cannot determine whether such a pattern exists. Future longitudinal analysis could potentially help establish whether this difference exists.

Additionally, our exploratory analysis demonstrated that, across a one-week period, college students were consistent in their COVID-19 preventative health behaviors and were accurate in estimating how they will implement those behaviors week-to-week, whether or not they had MDD or GAD. This finding seems contradictory to previous findings that those with depression are less likely to practice some health behaviors (Solberg, Trangle, & Wineman, 2005). Additional analysis of individual behavioral measures, such as washing hands or wearing masks, may help discern whether this discrepancy is true for all behaviors or only some.

This study has additional limitations that may have influenced the results and may be used to direct future research. First, the distribution of participants between those with and without mental health conditions was uneven, with 79% of participants meeting the threshold for one or two mental health conditions (Table 1). One major factor influencing the distribution of participants in mental health groups may be the effects of the pandemic itself on students. Many sources have indicated that the COVID-19 pandemic has had a profound impact on the mental health of college students specifically (Kecojevic, Basch, Sullivan, & Davi, 2020; Copeland, et al., 2020; Charles, Strong, Burns, Bullerjahn, & Serafine, 2021). An analysis of mental health condition diagnosis before and after COVID-19 may be able to account for this effect. Another limitation of this study involves the measurement of preventative health behaviors related to COVID-19. Since the scales asks participants to self-report and include only examples for the highest and lowest values, participants may have most identified with the examples at the top of the response scale. Further, at the time of the collection of data, the COVID-19 pandemic had been affecting participants' daily life for almost one year, by which point students at the University of Central Florida were receiving weekly emails with reminders and regulations about

implementing COVID-19 preventative behaviors. This external instruction likely influenced the levels of practicing preventative behavior, and perhaps, the lack of group effects on health behaviors.

CONCLUSION

As the COVID-19 pandemic begins its second year, it is important to further understand the many factors that influence college students and their relationship with the virus. This study provides the novel analysis of both risk perception and the presence of mental health conditions when determining how individuals may behave in the face of a global pandemic. Although the relationship between the presence of mental health conditions and practicing preventative behavior was not significant, the current study's finding that risk perception itself is related to the practice of preventative behaviors in the context of COVID-19 adds to the body of literature analyzing risk perception in relation to previous health crises.

With state mandated prevention measures in place, the long-term effects of the COVID-19 pandemic on one's willingness to adopt personal protective measures should be further analyzed in order to both prepare for potential future outbreaks as well as understand how some individuals may or may not be able to transition back to normalcy. The knowledge that individuals with mental health conditions tend to experience higher levels of affective risk perception, but these higher levels of risk perception do not lead to more preventative health behaviors in the face of COVID-19 demonstrates the need for further research to investigate this disconnect. This study, having been one of the few to test such moderating effects, leaves open the possibility for future discover of a more direct link between the presence of mental health conditions and differing adoption of preventative health behaviors relating to COVID-19.

Table 1. Demographics and scores

Variable (<i>n</i> = 226)	Control (<i>n</i> = 59)	Either Mental Health Condition (<i>n</i> = 167)	Depression Only (<i>n</i> = 41)	Anxiety Only (<i>n</i> = 27)	Depression and Anxiety (<i>n</i> = 99)
Female/male/other, %					
Female	84.7	85.6	80.5	81.5	88.9
Male	15.3	12.0	17.1	14.8	9.1
Neither Strictly M/F	0	2.4	2.4	3.7	2.0
Year in School, %					
Freshman	13.6	14.4	25.7	24.4	13.1
Sophomore	15.2	19.2	26.9	22.2	17.1
Junior	37.3	40.7	36.6	29.6	45.5
Senior	32.2	25.8	24.4	33.3	24.2
Other	1.7	0	0	0	0
Scores, Mean (<i>SD</i>)					
Depression	0.06 (0.06)	0.44 (0.26)	0.50 (0.22)	0.11 (0.05)	0.51 (0.23)
Anxiety	0.05 (0.08)	0.38 (0.23)	0.28 (0.24)	0.31 (0.13)	0.45(0.22)
Risk Perception (RP)	0.72 (0.13)	0.71 (0.12)	0.70 (0.14)	0.72 (0.12)	0.71(0.12)
Affective RP	0.70 (0.19)	0.79 (0.15)	0.77 (0.17)	0.81 (0.14)	0.79 (0.15)
Cognitive RP	0.75 (0.19)	0.62 (0.20)	0.63 (0.22)	0.62 (0.22)	0.62 (0.20)

Variable (<i>n</i> = 226)	Control (<i>n</i> = 59)	Either Mental Health Condition (<i>n</i> = 167)	Depression Only (<i>n</i> = 41)	Anxiety Only (<i>n</i> = 27)	Depression and Anxiety (<i>n</i> = 99)
Preventative Health	0.75 (0.17)	0.78 (0.14)	0.76 (0.16)	0.76 (0.13)	0.79 (0.14)
Behaviors					
Wearing Masks	0.91 (0.17)	0.94 (0.14)	0.93 (0.16)	0.95 (0.12)	0.94 (0.14)
Washing Hands	0.76 (0.25)	0.77 (0.21)	0.73 (0.24)	0.73 (0.21)	0.80 (0.19)
Sanitizing Items	0.68 (0.32)	0.68 (0.30)	0.65 (0.33)	0.66 (0.26)	0.70 (0.29)
Elbow Sneezing	0.94 (0.17)	0.92 (0.18)	0.91 (0.22)	0.90 (0.20)	0.93 (0.14)
Staying Home	0.48 (0.32)	0.57 (0.29)	0.57 (0.32)	0.57 (0.28)	0.57 (0.28)

Table 2. Regression of COVID-19 preventative behavior predictors

Predictor	<i>b</i>	<i>sr</i> ²	<i>r</i>	Fit	Difference
(Intercept)	0.59**				
Risk Perception	0.41**	.13	.36**		
Mental health conditions	0.03	.01	.06		
					$R^2 = .127^{**}$
(Intercept)	0.46**				
Risk Perception	0.55**	.06	.35**		
Mental health conditions	0.16	.01	.06		
Risk Perception*					
Mental health conditions	-0.18	.00	.14		
					$R^2 = .132^{**}$ $\Delta R^2 = .004$

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

Table 3. Alternate regression of COVID-19 preventative behavior with affective risk perception predictors

Predictor	<i>b</i>	<i>sr</i> ²	<i>r</i>	Fit	Difference
(Intercept)	0.58**				
Affective Risk Perception	0.26**	.08	.28**		
Mental Health Conditions	-0.00	.00	.06		
				$R^2 = .08^{**}$	
(Intercept)	0.53**				
Affective Risk Perception	0.32**	.04	.29**		
Mental health conditions	0.07	.00	.06		
Affective Risk Perception*	-0.10	.00	.13		
Mental health conditions					
				$R^2 = .083^{**}$	$\Delta R^2 = .003$

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

Table 4. Alternate regression of COVID-19 preventative behavior with cognitive risk perception predictors

Predictor	<i>b</i>	<i>sr</i> ²	<i>r</i>	Fit	Difference
(Intercept)	0.63**				
Cognitive Risk Perception	0.16**	.05	.19**		
Mental Health Conditions	0.04	.01	.06		
				$R^2 = .05^{**}$	
(Intercept)	0.60**				
Cognitive Risk Perception	0.20**	.02	.19**		
Mental health conditions	0.08	.00	.06		
Cognitive Risk Perception*	-0.05	.00	.15		
Mental health conditions					
				$R^2 = .052^{**}$	$\Delta R^2 = .001$

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

APPENDIX A: SCALE TO MEASURE RISK PERCEPTION

Affective risk perception inventory (5 items)

From Ding, et al. 2020

Please indicate using a 1 to 5 scale with, 1 indicating you strongly disagree with the statement and 5 indicating you strongly agree, the level to which you agree with the following statements.

1. I am worried about the possible consequences of COVID-19
2. I am afraid of the possible consequences of COVID-19
3. I hate the possible consequences of COVID-19
4. I am dissatisfied with the possible consequences of COVID-19
5. I am angry about the possible consequences of COVID-19

Cognitive risk perception inventory (5 items)

From Ding, et al. 2020

Please indicate using a 1 to 5 scale with, 1 indicating you strongly disagree with the statement and 5 indicating you strongly agree, the level to which you agree with the following statements.

1. Because I (and my family members) pay great attention to the epidemic, I think we have a low chance of being infected by COVID-19
2. Because I (and my family members) have a good lifestyle, I think we have a low chance of being infected by COVID-19
3. Because I (and my family members) know professional protection knowledge, I think we have a low chance of being infected by COVID-19
4. Because I (and my family members) am in good health, I think we have a low chance of being infected by COVID-19

APPENDIX B: SCALE TO MEASURE PREVENTATIVE HEALTH BEHAVIOR

Scale to measure preventative health behavior

From Hu, Mei, Niu, Tang, & Wang 2020

Please indicate on a 1 to 5 scale, with 1 being not at all and 5 being very frequently, your frequency of engaging in the following behaviors:

1. Wearing masks
2. Washing hands
3. Sanitizing clothes or other items
4. Sneezing into your elbows
5. Staying at home when possible

Please indicate on a 1 to 5 scale, with 1 being not at all and 5 being very frequently, your **predicted** frequency of engaging in the following behaviors over **the next week**:

1. Wearing masks
2. Washing hands
3. Sanitizing clothes or other items
4. Sneezing into your elbows
5. Staying at home when possible

APPENDIX C: MEASURES OF MENTAL HEALTH CONDITIONS

Self-Report of Mental Health Conditions

Please indicate whether or not you had been diagnosed by a licensed clinician with the following disorders **before January 2020**:

1. Major Depressive Disorder
2. Generalized Anxiety Disorder

Short-form Depression Anxiety Stress Scales (DASS-21

From Crawford & Henry 2005

Please indicate on a 1 to 4 scale, with 1 being NEVER, 2 being SOMETIMES, 3 being OFTEN, and 4 being ALMOST ALWAYS how much the following statements applied to you over the past week:

1. I found it hard to wind down
2. I was aware of dryness in my mouth
3. I couldn't seem to experience any positive feelings at all
4. I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)
5. I found it difficult to work up the initiative to do things
6. I tended to over-react to situations
7. I experienced trembling (eg, in the hands)
8. I felt that I was using a lot of nervous energy
9. I was worried about situations in which I might panic and make a fool of myself
10. I felt that I had nothing to look forward to
11. I found myself getting agitated

12. I found it difficult to relax
13. I felt down hearted and blue
14. I was intolerant of anything that kept me from getting on with what I was doing
15. I felt I was close to panic
16. I was unable to become enthusiastic about anything
17. I felt I wasn't worth much as a person
18. I felt that I was rather touchy
19. I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart increase, heart missing a beat)
20. I felt scared without any good reason
21. I felt that life was meaningless

APPENDIX D: DEMOGRAPHIC INVENTORY

Demographic Inventory

1. What is your gender?

Male

Female

Other

2. What is your ethnicity?

White

Hispanic or Latino

Black or African American

Native American or American Indian

Asian/Pacific Islander

Other

3. What is your current level of college education?

Freshman

Sophomore

Junior

Senior

Graduate Student

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