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Daily functioning and compliance to health precautions in relation to COVID-19

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Daily Functioning and Compliance to Health Precautions in Relation to COVID-19

by

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Abstract

The present study cross-sectionally investigated the moderating effect of vaccination status on the relationship between COVID-19 related anxiety and functional impairment, and the moderating effect of health literacy on the relationship between source of COVID-19 information (e.g., healthcare providers, public health organizations, liberal media outlets, and conservative media outlets) and preventative measure compliance. Participants (N = 126) completed an online survey via Prolific that measured their functional impairment, anxiety, health literacy, precaution compliance, and level of trust of various sources of COVID-19 information. Vaccination status did not significantly moderate the relationship between participants' anxiety and functional impairment, and health literacy only significantly moderated the relationship between trust in conservative media outlets and compliance to preventative measures. Given that the results of this study contrast with much of the previous literature, more research is needed to identify mitigating factors to the obstacles of compliance, ensure that individuals can resume a life of normalcy as quickly as possible, and reduce the loss of life if faced with a similar situation in the future.

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Daily Functioning and Compliance to Health Precautions in Relation to COVID-19

Since the emergence of the coronavirus disease in 2019, the world has been devastated by this unprecedented illness that has resulted in an ongoing global pandemic. The coronavirus disease (COVID-19) is caused by the extremely contagious SARS-CoV-2 virus that attacks the respiratory system and produces symptoms similar to the flu, cold, or pneumonia (Centers for Disease Control and Prevention, 2021). Due to the viral nature of COVID-19, the world has observed the virus quickly replicate which has led to the emergence of multiple variants being: Beta and Delta in December 2020, Gamma in January 2021, and Omicron in November 2021 (Cascella et al., 2022). While most individuals infected with COVID-19 may experience mild symptoms, the disease can be deadly to individuals of any age, especially those who have an underlying medical condition such as cancer, chronic respiratory disease, or cardiovascular diseases (World Health Organization [WHO], n.d.-a). At the time of writing this paper, the WHO has reported over 5.8 million COVID-19 related deaths globally (WHO, n.d.-b).

Respiratory viruses, such as COVID-19, are spread through particles of an infected individual's mouth or nose when they sneeze, speak, cough, or breathe (WHO, n.d.-a). The WHO and many other public health agencies, such as the Centers for Disease Control and Prevention (CDC), have issued preventative public health measures that every individual should employ to effectively reduce the viral transmission of COVID-19. While preventative measures have evolved throughout the pandemic, the WHO currently states that to protect yourself and those around you, individuals should wear a properly fitted mask, frequently wash their hands with an alcohol-based cleanser or soap and water, and maintain a social distance of one meter (3.2 feet) from other people (WHO, 2021).

In a 2021 cross-sectional survey study, researchers examined the association of self-reported mask-wearing and the spread of COVID-19 within the United States. From a sample of 375,309 respondents, the authors identified that mask-wearing is associated with an increased likelihood of controlling the transmission of the virus (Rader et al., 2021). Due to the observational nature of the study, researchers are unable to draw causal conclusions from the findings. However, this finding is very similar to another study that identified that a government mask mandate for public spaces in 15 states demonstrated a statistically significant ($p < .05$) decrease in the daily number of COVID-19 new cases (Lyu & Wehby, 2020).

Within a 2021 report, Guo and colleagues (2021) utilized an observational time-series design to investigate the effectiveness of social distancing in reducing COVID-19 transmission. Researchers collected the daily number of confirmed COVID-19 cases from 50 states and one US territory. They observed that social distancing displayed a statistically significant ($p < .001$) decline in the transmission of the virus. This finding is consistent with a study of 8,158 participants that reported a statistically significant ($p = .002$) increased risk of contracting COVID-19 for individuals who did not practice social distancing. The researchers also noted that individuals who did not wash their hands were at a statistically significant ($p = .009$) increased risk of COVID-19 infection (Xu et al., 2020).

Despite the effectiveness of the previously mentioned preventative measures, there is still hesitancy among populations within the United States to follow the WHO and CDC guidelines and preventative measures. Due to the rapid infection and replication rates of viruses, this hesitancy has given the COVID-19 virus the opportunity to give rise to several variants that have been previously mentioned. These variants are not only dangerous due to their aggressive transmissibility, but also threatens our current progress in managing the virus due to their

changing structure and potentially devastating new characteristics. Therefore, it is vital that we practice these preventative measures to reduce transmission and prevent the unnecessary loss of life.

One approach to take when trying to identify potential barriers for compliance with preventative measures would be to assess an individual's health literacy. Health literacy is the ability to compile, understand, and implement healthcare-related information in order to make a decision about one's health. With the massive amounts of constantly changing information surrounding COVID-19, it is crucial for individuals to gain the skills necessary to seek out and comprehend COVID-19 information that could save not only their life, but those around them. One study compared different social determinants (e.g., socioeconomic status [SES], race, education level, geographic information) within various regions in Arkansas to examine the impact of the previously mentioned determinants on COVID-19. After controlling for SES, researchers discovered that rural areas with lower health literacy displayed a statistically significant ($p < .001$) larger rate of positive COVID-19 cases (Greer et al., 2021).

The entire world has seen an increase in the presentation of generalized anxiety and the deterioration of quality of life due to the uncertainty and social isolation created by COVID-19 (Babicki et al., 2021). A study by Perez-Arce et al. (2021) examined the difference in an individual's level of mental distress based on if they received their first dose of the COVID-19 vaccine. Researchers collected data from a nationally representative sample of 8,003 participants from the United States and measured their mental distress using the Patient Health Questionnaire (PHQ-4). This measure is comprised of two items examining anxiety symptoms and two items assessing depressive symptoms (Kroenke et al., 2009). The authors identified that those who received their first dose of the COVID-19 vaccine reported a statistically significant decrease in

the likelihood of being severely depressed; however, there was no significant reduction in the probability of being mildly depressed and experiencing moderate mental distress (Perez-Arce et al., 2021). It is of note that the authors did not provide information on the effect of vaccination status on anxiety symptomology, but rather, they used the blanket term mental distress. However, Babicki and colleagues (2021) investigated the effects of receiving the COVID-19 vaccine and individuals' anxiety levels within Poland. The researchers found that individuals who were fully vaccinated indicated lower levels of anxiety compared to those who were partially vaccinated with one dose. They also noted that individuals who were unwilling to receive the vaccine indicated the lowest levels of anxiety out of all groups.

Justification and Significance

Previous research has identified that the United States has seen an increase within the population's anxiety levels of any severity from 15% in 2019 to 53% in 2020 (Hansel et al., 2022; Terlizzi & Villarroel, 2020). It has also been demonstrated that an individual's increased anxiety level stemming from the COVID-19 pandemic is associated with a decrease in their quality of life (e.g., ability to perform daily tasks and performance ability at work; Hansel et al., 2022). This drastic increase calls for the need to examine factors that could potentially mitigate an individual's anxiety level and the inability to perform daily tasks.

There is additional concern surrounding the need for the population to engage in COVID-19 preventative measures. With the increased accessibility of COVID-19 information, public health officials are faced with a surge of misinformation due to a lack of verifiability with online platforms, such as social media. For example, a 2020 report examined the rate of misinformation on the social media platform Twitter and discovered that nearly 25% of the analyzed tweets contained misinformation surrounding the COVID-19 pandemic (Kouzy et al., 2020). A study by

McCaffery et al. (2020) identified that those with lower health literacy were more likely to support COVID-19 misinformation, less likely to engage in preventative measures (e.g., social distancing), and demonstrated an inadequate understanding of COVID-19 symptoms. This finding is similar to Naveed and Shaukat (2021), where the researchers found that health literacy was a statistically significant positive predictor of preventative measure engagement. Additionally, mainstream media outlets are noted to be a significant factor for COVID-19 information and related beliefs (Ali et al., 2020). The messaging of certain beliefs and perceived risks of COVID-19 appears to be polarized based on the political affiliation of these mainstream media outlets. For example, individuals who relied on CNN or MSNBC (i.e., liberal media outlets) for their information endorsed statements that indicated a greater perceived risk of COVID-19, whereas those who relied on Fox News (i.e., conservative media outlet) endorsed statements that indicated a lesser perceived risk of COVID-19 (Ali et al., 2020). A review conducted by Bish and Michie (2010) found that individuals who perceived a disease as a greater risk demonstrated an increased likelihood of engaging in preventative measures. In order to reduce the potential increase in COVID-19 variants, it is important to examine factors that could impact the relationship between an individual's source of COVID-19 information, perceived risk, and compliance to preventative measures.

Purpose of the Study

This paper will examine two specific aims and their related hypotheses concerning the public health crisis that is the ongoing COVID-19 pandemic. The first hypothesis will examine an individual’s vaccination status and the potential antagonistic effect on the relationship between COVID-19 anxiety and impairment in daily functioning. The second hypothesis will examine health literacy and the potential enhancing effect on the relationship between an

individual's source of COVID-19 information and their compliance to COVID-19 preventative measures. These obstacles have led to the continuation of this pandemic, unnecessary loss of life, and the deterioration of individuals' ability to carry out tasks in their daily lives.

In an effort to identify mitigating factors to the obstacles we currently face, and add to the growing collection of academic knowledge on COVID-19, this paper will address the following:

Specific Aim 1: To investigate the effect of receiving the COVID-19 vaccine on the relationship between COVID-19 related anxiety and impairment in an individual's daily functioning.

Hypothesis 1. Previous literature has indicated an association between COVID-19 vaccination status and anxiety severity. It is hypothesized that individuals who receive the COVID-19 vaccine will report a decrease in the strength of the relationship between COVID-19 related anxiety and impairment in daily functioning.

Specific Aim 2: To investigate the effect of an individual's health literacy on the relationship between their source of COVID-19 information and compliance to COVID-19 precautions.

Hypothesis 2a. Previous literature has noted an association between an individual's health literacy and compliance to health precautions. It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from public health organizations and compliance to COVID-19 health precautions.

Hypothesis 2b. It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from healthcare providers and compliance to COVID-19 health precautions.

Hypothesis 2c. It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from liberal media outlets and compliance to COVID-19 health precautions.

Hypothesis 2d. It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from conservative media outlets and compliance to COVID-19 health precautions.

This research will not only illuminate potential mitigating factors but will allow the academic community and public health officials to use this information to help shape future policy in the hopes of lessening the devastating effects of potential future pandemics. Shaping public policy from the information that is gathered from the current pandemic will allow individuals to resume a life of normalcy as quickly as possible and reduce the loss of life if faced with a similar situation in the future.

Methods

The current study was a cross-sectional research design to identify the impact of the variables COVID-19 vaccination and health literacy within two separate moderation analyses. The researcher utilized quantitative methods through the collection of participants' COVID-19 anxiety, vaccination status, impairment in daily functioning, source of COVID-19 information, health literacy, and compliance to COVID-19 precautions. The population of interest for this study was individuals living within the United States. Participant data was collected from a self-selection sample of anyone 18 years or older within the United States through an online survey. The sampling frame consisted of individuals who were 18 years or older, live within the United

States, have access to the internet (e.g., via computer, cellphone, or tablet), have a Prolific account, and completed an acceptable number of questions within the survey.

Data for the current study was collected online via the Prolific platform. Prolific is a website geared towards researchers to crowdsource participants for the purpose of behavioral research. In order to establish that researchers receive quality data from participants on Prolific, the website has implemented a multitude of checks to prevent internet bots from completing studies, which prevents collection of potentially inaccurate data. The platform states that it limits the number of accounts that use the same internet protocol (IP) addresses, blocks untrustworthy IP addresses, and monitors their internal data for unusual data reporting patterns (Bradley, 2018). A 2017 study examined the quality of data from three research crowdsourcing websites: Amazon Mechanical Turk (MTurk), CrowdFlower (CF), and Prolific Academic (ProA). The researchers identified that both MTurk and ProA had a high rate of reliability in the data produced compared to CF. This suggests that participants on both MTurk and ProA carefully followed study instructions and consistently completed surveys. The study also demonstrated that ProA and CF produced data from a more diverse population of participants and exhibited lower rates of misreporting performance in order to obtain extra compensation compared to MTurk (Peer et al., 2017). This study aligns with Prolific's assertion that it produces quality data for researchers and demonstrates that its platform checks are preventing computer-generated responses for questionnaires.

Measures

Overall Anxiety Severity and Impairment Scale (OASIS)

The OASIS is a five-item self-report measure that examines the intensity and prevalence of an individual's anxiety and anxiety-related impairment within multiple aspects of their life

(e.g., social life, work, and relationships). Participants rate the severity and frequency of each item on a 5-point scale ranging from *none* to *extreme* (Norman et al., 2006). The instrument demonstrates strong internal consistency with Cronbach's $\alpha = .80$ and acceptable convergent validity with the Spielberger Trait Anxiety Questionnaire ($r = .62$), Brief Symptom Inventory ($r = .58$), and Fear Questionnaire ($r = .41$). Higher scores on the OASIS indicate a greater degree of anxiety severity and impairment.

Work and Social Adjustment Scale (WSAS)

This measure is a five-item self-report scale that assesses the impact of a specific issue resulting in an individual's impairment within their relationships, public and private leisure, work, and home management (Mundt et al., 2002). Items within the measure were adapted to evaluate an individual's impairment due to the COVID-19 pandemic. Participants report the extent to which each component of their life is impaired on a 9-point scale ranging from *not at all* to *very severely*. Higher scores indicate more severe impairment, and lower scores indicate lower impairment in the individual's daily life. The measure demonstrates moderate to strong internal consistency among questions with Cronbach's $\alpha = .70 - .94$ (Mundt et al., 2002).

COVID-19 Trusted Sources

Items included in this measure were adapted from the Johns Hopkins Bloomberg School of Public Health COVID-19 Community Response Survey (Mehta, 2020). The original survey examined the impact of ten factors within a community during the COVID-19 pandemic (e.g., sexual behavior, substance use, mental health, violence, social distancing, knowledge, attitudes, co-morbidities, symptoms, and stress). To assess individuals' trusted COVID-19 sources, participants were asked to rate on a 3-point scale ranging from *not at all* to *completely* sources they believe provided accurate information on the COVID-19 pandemic.

COVID-19 Precaution Compliance

To assess COVID-19 compliance rates, six items were created by the research team to examine how often participants were wearing masks in public during the pandemic and currently, how often participants were socially distancing in public spaces during the pandemic and currently, and how often participants were avoiding social gatherings during the pandemic and currently. Respondents rate their level of compliance on a 5-point Likert scale ranging from *never* to *always*, with higher scores indicating greater compliance.

COVID-19 Health Literacy

Items within this measure were adapted from the COVID-19 Impact on Health and Wellbeing Survey. The original measure examined eight domains of an individual's overall well-being (e.g., depression, anxiety, stress, health literacy, trusted sources, compliance, physical activity, and financial stress) as related to the COVID-19 pandemic (Robledo, 2020). To evaluate how each individual understands and processes health information, participants were presented with four items that measured medical comprehension (e.g., "Are you confident in filling out medical forms by yourself?") and asked to rate their level of agreement on a 5-point scale ranging from *always* to *never*.

Safety and Confidentiality

To ensure the safety and confidentiality of the participants, any identifiable information was replaced with a study ID code. The electronically collected data was stored in a password-protected file only accessible to the principal investigator. This data will be stored in the password-protected file for at least five years after the project ends. After that time has elapsed, the data will be permanently destroyed. While some of the survey questions are personal in nature, the researcher only asked items relevant to the research questions at hand. The research

participants were made aware that they do not have to answer any question that makes them feel uncomfortable. Items that were more personal only asked for the minimum amount of specified information to answer the research questions. For example, “Have you been diagnosed with anxiety, yes or no?” Research results were disseminated in an aggregated form only and did not contain any identifiable information or study ID code. If the participant wished for their data to be discarded at any time, the subject could email the principal investigator requesting for their data to be destroyed. The participants were also made aware that the researcher cannot destroy any information that has already been published.

Sample Demographics

The final sample consisted of 45.7% of the participants reporting their age being from 31 to 40 years, and the total sample age ranged from 19 to 76 years (M = 36.9, SD = 12.3). The ethnicity breakdown of the sample was predominantly Caucasian (82.54%), Asian (4.76%), African American (3.97%), Hispanic (2.38%), Native American (1.59%), Middle Eastern (0.79%), and prefer not to answer (3.97%). The spread of gender within the sample was fairly even with females consisting of 48.42 %, males 49.21%, transgender male 0.79%, genderqueer 0.79%, and preferred not to answer 0.79%. Also, an overwhelming majority of the sample reported being vaccinated, and only 23.02% reported not being vaccinated. Results are presented in Table 1.

Table 1

Sample Descriptive Statistics

Age	*n*	Percent
18-30	37	28.7
31-40	59	45.7
41-50	10	7.8
51-60	15	11.6
61-70	5	3.9
71-80	3	2.3

Sex	*n*	Percent
Female	61	48.42
Male	62	49.21
Transgender Female	0	0
Transgender Male	1	0.79
Genderqueer	1	0.79
Prefer not to answer	1	0.79

Ethnicity	*n*	Percent
Caucasian	104	82.54
Asian	6	4.76
African American	5	3.97
Hispanic	3	2.38
Native American	2	1.59
Middle Eastern	1	0.79
Prefer not to answer	5	3.97

Vaccination Status	Yes *n* (%)	No *n* (%)
Vaccinated	97 (76.98)	-
Not Vaccinated	-	29 (23.02)

Results

Data Screening

A data screening procedure was first conducted prior to the main analyses. A Mardia's test was conducted to examine the skewness and kurtosis of the multivariate data structure that included the variables: vaccination status, anxiety, work and social impairment, source of COVID-19 information (e.g., liberal media outlet, conservative media outlet, healthcare

providers, public health organizations), compliance to health precautions, and health literacy. Results indicated that the assumption of multivariate normality was not met, with skewness = 164.61, p = 3.57 and kurtosis = -1.17, p = 0.24. Additionally, 31 multivariate outliers were identified utilizing the Mahalanobis distance statistic (cutoff of p = .001) with the untransformed variables.

Further evaluation of normality at the univariate level uncovered that the source of COVID-19 information (i.e., liberal media outlets, conservative media outlets, healthcare providers, and public health organizations) had met the skewness and kurtosis normality assumptions with cut-off values under the 3.2 threshold. The variables health literacy, compliance to health precautions, COVID-19 anxiety, and daily functional impairment did not meet the 3.2 cut-off, therefore, data transformation procedure was conducted. A logarithmic transformation was performed for anxiety and functional impairment, while a square root and inverse transformation was conducted for compliance and health literacy, respectively. After data transformation, multivariate normality was met, with skewness = 70.23, p = 0.86, and no outlier was detected using the Mahalanobis distance statistic (cutoff of p = .001) with the transformed variables.

Missing Data

Prior to initial data analysis, participant data was inspected to identify incomplete responses and patterns of missing data. Participants who had only completed a marginal amount (e.g., answering less than four items) of the survey were removed from the dataset. In total, one hundred and twenty-six responses were included in the analyses. Little's (1988) Missing Completely at Random (MCAR) test was performed to determine if there were systematic differences from participants that did not respond compared to those who did. The results

indicated that the MCAR expectation was met, with $\chi^2(9) = 76.8$, $p = .11$. To confront the missing data, multiple imputation utilizing predictive mean matching (PMM) was performed for all instances of missing data. PMM produces several plausible datasets based on the completed responses from each variable. Then, one predicted value from the datasets is randomly selected and replaces the missing data value (Kleinke, 2017). This approach produces more stable parameter estimates and reduces the risk of statistical power reduction compared to other approaches such as listwise deletion.

Descriptive Statistics

Predictor Variables

Source of COVID-19 Information. Results of participants' trusted source of COVID-19 information are presented in Table 2. Generally, 71.43% of the sample endorsed that they do not trust conservative media outlets to provide accurate information on the COVID-19 pandemic, and 43.65% did not trust liberal media outlets to provide accurate information on the pandemic. Participants indicated a higher level of trust in public health organizations and healthcare providers, with 46.03% somewhat trusting public health organizations to provide truthful information and 49.21% completely trusting healthcare providers to provide truthful COVID-19 information. Global scores of the measure indicate that healthcare providers were rated as the most trusted source of COVID-19 information out of all the choices ($M = 2.42$, $SD = 0.61$).

Table 2

Source of COVID Information

	Not at all Trust *n* (%)	Somewhat Trust *n* (%)	Completely Trust *n* (%)	Global Score *M (SD)*
Healthcare providers	8 (6.35)	56 (44.44)	62 (49.21)	2.42 (0.61)
Public health organizations	23 (18.25)	58 (46.03)	45 (35.72)	2.18 (0.72)
Conservative media	90 (71.43)	34 (26.98)	2 (1.59)	1.30 (0.49)
Liberal media	55 (43.65)	62 (49.21)	9 (7.14)	1.65 (0.61)

Anxiety. Respondents' anxiety scores across all measure items were low, with mean scores of less than two for each item. The mean global anxiety score for the sample was at the cusp of the clinical cutoff range (i.e., cutoff range for mild or no anxiety is from 0 to 5) for experiencing mild or no anxiety due to the pandemic (M = 5.17, SD = 4.76). Overall, 57.14% of the sample experienced mild or no anxiety, 25.40% experienced moderate levels of anxiety, 15.87% experienced severe levels of anxiety, and 1.59% experienced extreme levels of anxiety. Results of the OASIS measure are reported in Table 3.

Table 3

Predictor Variable Results

Measure	Anxiety Severity					
	Mild or none *n* (%)	Moderate *n* (%)	Severe *n* (%)	Extreme *n* (%)	*M*	*SD*
Anxiety						
Global Score	72 (57.14)	32 (25.40)	20 (15.87)	2 (1.59)	5.17	4.76
Health Literacy						
Global Score					17.84	2.96

Health Literacy. Participants demonstrated a high degree of comprehension when processing COVID-19 related health information with a mean score of 17.84 and standard deviation of 2.96 (i.e., higher scores are equated with greater health literacy with a maximum score of 20). Generally, 69.05% of the sample endorsed that they never need another individual to read hospital materials to them, 62.70% stated that they were always confident in filling out medical forms themselves, 74.60% never had problems with learning about their medical condition due to the inability to comprehend written information, and 68.25% indicated that they never have problems understanding information presented to them about their medical condition. Participant health literacy scores are presented in Table 3.

Outcome Variables

Work and Social Impairment. Participant impairment scores are reported in Table 4. Overall, a majority of participants endorsed experiencing moderate impairment in their ability to perform daily tasks due to the COVID-19 pandemic (41.19%), followed by low impairment (27.78%) and severe impairment (26.98%). Additionally, across all five measure items, participants indicated that social leisure activities was an area of their lives that experienced the greatest amount of impairment (M = 4.98, SD = 2.64).

Table 4

Outcome Variable Results

Measure	Impairment Severity				
	Low *n* (%)	Moderate *n* (%)	Severe *n* (%)	*M*	*SD*
Work and Social Impairment Global Score	35 (27.78)	57 (41.19)	34 (26.98)	15.33	8.90
Precaution Compliance Global Score				22.58	6.31

Precaution Compliance. Results of participants compliance to COVID-19 safety precautions are presented in Table 4. Participants global scores on compliance ranged from 6 to 30 on a 5-point scale from *never* to *always*. Overall, the average total score across all respondents was 22.58 (SD = 6.31). On average, participants reported compliance rates on wearing masks in public when the pandemic started from *never* to *always* (M = 4.07, SD = 1.41), currently wearing masks in public from *never* to *always* (M = 3.65, SD = 1.42), social distancing when the pandemic started from *never* to *always* (M = 4.07, SD = 1.35), currently social distancing from *never* to *always* (M = 3.49, SD = 1.38), avoiding social gathering when the pandemic started from *never* to *always* (M = 4.11, SD = 1.34), and currently avoiding social gatherings from *never* to *always* (M = 3.13, SD = 1.42).

Bivariate Correlations

Correlations for variables analyzed in Hypothesis 1 (e.g., work and social impairment, anxiety, and vaccination status) are reported in Table 5, and correlations for variables analyzed in Hypothesis 2 (e.g., compliance, health literacy, healthcare providers, public health organizations, conservative media outlets, and liberal media outlets) are presented in Table 6. Within Hypothesis 1, vaccination status and anxiety scores were significantly correlated ($p = .01$), while anxiety scores and impairment scores exhibited weak correlations. Within Hypothesis 2, healthcare providers ($p < .001$), public health organizations ($p < .001$), and liberal media outlets ($p < .001$) demonstrated significant correlations with compliance to safety precautions.

Table 5

Correlation Matrix of Studied Variables in Hypothesis 1

Variable	1	2
1. Impairment		
2. Anxiety	0.05	
3. Vaccine status	0.03	0.24*

Note. *$p < .01$.

Table 6

Correlation Matrix of Studied Variables in Hypothesis 2

Variable	1	2	3	4	5
1. Compliance					
2. Health literacy	0.08				
3. Healthcare providers	-0.28*	0.13			
4. Public health organizations	-0.36*	0.10	0.63*		
5. Conservative media outlets	-0.06	0.12	-0.03	0.03	
6. Liberal media outlets	-0.30*	-0.10	0.31*	0.56*	0.29*

Note. *$p < .001$.

Multiple Regression

A multiple regression analysis was employed to investigate the moderating effect of individuals' vaccination status and COVID-19 related anxiety on their daily functional

impairment. Hypothesis 1 stated that the COVID-19 vaccine will reduce the strength of the relationship between anxiety and functional impairment. Within the dataset, the dichotomous predictor variable vaccination status was coded as 0 (i.e., have not received the COVID-19 vaccine) and 1 (have received the COVID-19 vaccine). The continuous predictor variables were standardized into z-scores to reduce multicollinearity within the regression model. Within the analysis, the predictor variables were entered in Step 1 and the interaction term was entered in Step 2.

The main effects of vaccination status (b = .05, SE = .13, p = .69) and anxiety (b = .02, SE = .06, p = .78) did not significantly predict impairment scores. The addition of the interaction term showed that vaccination status did not significantly moderate the relationship between anxiety and impairment (b = .05, SE = .12, p = .69). Results of the multiple regression for Hypothesis 1 are presented in Table 7.

Table 7

Predicting Functional Impairment from Vaccination Status and Anxiety

Variable	*b*	*SE*	R^2	ΔR^2
Step 1			.0026	
(Intercept)	2.52*	0.12		
Vaccine	0.05	0.13		
Anxiety	0.02	0.06		
Step 2			.0039	.0013
(Intercept)	2.51*	0.12		
Vaccine	0.07	0.14		
Anxiety	-0.02	0.10		
Vaccine*Anxiety	0.05	0.12		

Note. *p < .001

Hierarchical Regression

A hierarchical regression analysis was employed to investigate the moderating effect of individuals' health literacy and source of COVID-19 information (e.g., healthcare providers, public health organizations, conservative media outlets, liberal media outlets) on their

compliance to engage in safety precautions (e.g., wearing masks in public, social distancing, avoiding public gatherings). Hypothesis 2 stated that greater health literacy will strengthen the relationship between participants' source of COVID-19 information and compliance to health precautions. Within the dataset, the continuous predictor variables were standardized into z-scores to reduce multicollinearity within the regression models. Within the analysis, the predictor variables were entered in Step 1 and the interaction term was entered in Step 2.

A preliminary examination of the regression analysis of the non-transformed data revealed that the variable public health organizations in Model 1 was a significant positive predictor of individuals' compliance (b = 2.66, SE = .65, p < .001), while health literacy was a non-significant predictor of compliance (b = .74, SE = .66, p = .26). The addition of the interaction term in Model 1 resulted in a non-significant change in the variance explained (ΔR^2 = 0.024, p = .11). Within Model 2, the variable healthcare providers was a significant positive predictor of compliance (b = 2.19, SE = .67, p < .001), while health literacy was a non-significant predictor of compliance (b = .60, SE = .66, p = .38). The addition of the interaction term in Model 2 resulted in a non-significant change in the variance explained (ΔR^2 = 0.014, p = .25). Model 3 identified the variable liberal media outlets as a significant positive predictor of compliance (b = 2.47, SE = .66, p < .001), while health literacy was a non-significant predictor of individuals' compliance (b = .99, SE = .70, p = .16). The addition of the interaction term in Model 3 resulted in a non-significant change in the variance explained (ΔR^2 = 0.018, p = .17). Within Model 4, both health literacy (b = .86, SE = .74, p = .25) and trust in conservative media outlets (b = -.38, SE = .76, p = .62) variables were non-significant predictors of safety precaution compliance. The addition of the interaction term in Model 4 resulted in a significant change in

the variance explained ($\Delta R^2 = 0.052$, $p = .03$). Results of the main effects of functional impairment on the predictor variables for the non-transformed data are presented in Table 8.

Within the regression analysis for the second hypothesis of the transformed data, the variable public health organizations in Model 1 was a significant negative predictor of individuals' compliance ($b = -.40$, $SE = .09$, $p < .001$), while health literacy was a non-significant predictor of compliance ($b = .13$, $SE = .09$, $p = .17$). The addition of the interaction term (i.e., health literacy and public health organizations) revealed a non-significant change in the explained variance ($\Delta R^2 = 0.00$, $p = .96$). An examination of the variables within Model 2 identified that healthcare providers was a significant negative predictor of compliance ($b = -.33$, $SE = .09$, $p < .001$), while health literacy was non-significant ($b = .13$, $SE = .09$, $p = .18$). The inclusion of the interaction term (i.e., health literacy and healthcare providers) resulted in a non-significant change in the explained variance ($\Delta R^2 = 0.001$, $p = .70$). Model 3 revealed that liberal media outlets was a significant negative predictor of compliance ($b = -.34$, $SE = .09$, $p < .001$), whereas health literacy was again non-significant ($b = .12$, $SE = .09$, $p = .21$). Similar to the two previously mentioned models, the addition of the interaction term in Model 3 resulted in a non-significant change in the explained variance ($\Delta R^2 = 0.003$, $p = .55$). Results of the main effects of functional impairment on the predictor variables for the transformed data are presented in Table 9.

Table 8

Hierarchical Regression Non-Transformed Data Main Effects

Variable	*b*	*SE*	*t*	*p*	R^2
Model 1					.175
Health Literacy	0.74	0.66	1.14	0.26	
Public Health Organizations	2.66	0.65	4.10	0.00*	
Model 2					.121
Health Literacy	0.60	0.66	0.90	0.38	
Healthcare Providers	2.19	0.67	3.28	0.00*	
Model 3					.163
Health Literacy	0.99	0.70	1.41	0.16	
Liberal Media Outlets	2.47	0.66	3.76	0.00*	
Model 4					.055
Health Literacy	0.86	0.74	1.16	0.25	
Conservative Media Outlets	-0.38	0.76	-0.50	0.62	

Note. * $p < .001$

Table 9

Hierarchical Regression Transformed Data Main Effects

Variable	*b*	*SE*	*t*	*p*	R^2
Model 1					.1443
Health Literacy	0.13	0.09	1.39	0.17	
Public Health Organizations	-0.40	0.09	-4.25	0.00*	
Model 2					.0937
Health Literacy	0.13	0.09	1.33	0.18	
Healthcare Providers	-0.33	0.09	-3.45	0.00*	
Model 3					.1026
Health Literacy	0.12	0.09	1.25	0.21	
Liberal Media Outlets	-0.34	0.09	-3.64	0.00*	
Model 4					.0108
Health Literacy	0.09	0.09	0.91	0.36	
Conservative Media Outlets	-0.07	0.09	-0.74	0.46	

Note. * $p < .001$

An examination of Model 4 within the regression analysis demonstrated that both health literacy (b = .09, SE = .09, p = .36) and trust in conservative media outlets (b = -.07, SE = .09, p = .46) variables were non-significant predictors of safety precaution compliance. However, the addition of the interaction term in Step 2 of the model resulted in a significant change in the

variance explained ($\Delta R^2 = 0.036$, $p = .03$). The simple slopes analysis revealed that high levels of health literacy and lower levels of trust in conservative media outlets positively predicted precaution compliance. Results of the regression analysis for Model 4 are presented in Table 10.

Table 10

Predicting Compliance from Health Literacy and Conservative Media Outlets

Variable	*b*	*SE*	R^2	ΔR^2
Step 1			.0108	
(Intercept)	2.69**	0.10		
Health Literacy	0.09	0.10		
Conservative Media Outlets	-0.07	0.10		
Step 2			.0453	.0345*
(Intercept)	2.71**	0.10		
Health Literacy	0.10	0.10		
Conservative Media Outlets	-0.03	0.10		
Health Literacy*Conservative Media Outlets	-0.20*	0.10		

Note. *$p < .05$. **$p < .001$.

Discussion

With the rise of the COVID-19 virus, the world has experienced a surge in the manifestation of generalized anxiety caused by the unpredictability of this pandemic, with the United States alone experiencing a spike in the general population's anxiety levels from 15% in 2019 to 53% in 2020 (Babicki et al., 2021; Hansel et al., 2022; Terlizzi & Villarroel, 2020). This increase in COVID-19 related anxiety has been associated with a deterioration in individuals' ability to perform daily tasks and performance ability at work. Previous research has identified that engaging in preventative measures (e.g., wearing masks, social distancing, washing hands) have produced statistically significant reductions in the viral transmission of COVID-19 (Guo et al., 2021; Lyu & Wehby, 2020; Rader et al., 2021; Xu et al., 2020). Despite this information, there remains hesitancy among certain populations within the United States to engage in these

preventative measures and has seen an increase in COVID-19 misinformation via social media platforms (Kouzy et al., 2020). Multiple studies have found that those with lower health literacy were more likely to support COVID-19 misinformation and health literacy was a positive predictor of preventative measure engagement (McCaffery et al., 2020; Naveed & Shaukat, 2021).

The current study aimed to expand upon previous literature and identify mitigating factors to reduce the devastating effects of this pandemic by examining the effect of one's vaccination status on the relationship between COVID-19 anxiety and functional impairment, and the effect of health literacy on the relationship between source of COVID-19 information and compliance to engage in preventative safety measures.

Hypothesis 1

It was hypothesized that individuals who received the COVID-19 vaccine will report a decrease in the relationship strength between COVID-10 related anxiety and impairment in daily functioning.

This hypothesis was not supported by the data presented within this study. An examination of anxiety and vaccination scores revealed that both COVID-19 related anxiety and vaccination status were not significantly related to one's functional ability to carry out daily tasks. However, there was a significant positive correlation between vaccine status and COVID-19 anxiety. This finding suggests that as vaccination status increases (i.e., as the likelihood that one is vaccinated increases), COVID-19 related anxiety increases as well. The interaction effect of anxiety and vaccination status on functional impairment was also non-significant, suggesting that an individual's vaccination status was not associated with their anxiety levels and daily functioning. These findings were surprising given that previous research had identified that

increased levels of COVID-19 related anxiety were associated with a reduction in an individual's ability to carry out daily household tasks, and receiving the COVID-19 vaccine reduced individuals' anxiety (Babicki et al., 2021; Hansel et al., 2022; Perez-Arce et al., 2021).

It is possible that the functional impairment scores were influenced by the timing of data collection. Since these scores were collected nearly two years into the pandemic, the challenges and changes to individual's daily routines may not be as severe compared to the impairment they may have faced towards the beginning of the pandemic. This gradual decline in functional impairment could be due to individuals learning to adapt to their new way of life in order to maintain a source of income, interpersonal relationships, and general well-being.

Hypothesis 2a

It was hypothesized that greater health literacy would strengthen the relationship between COVID-19 information from public health organizations and compliance to COVID-19 health precautions.

This hypothesis was not supported by the findings within the current study. An exploration of trust in public health organizations and health literacy scores found that health literacy was not significantly related to individuals' compliance to COVID-19 safety precautions, but lower levels of trust in public health organizations was significantly related to greater compliance to safety precautions. The interaction effect of health literacy and public health organizations on compliance was found to be non-significant. These findings indicate that individuals were more likely to engage in COVID-19 precautions (e.g., wearing masks, social distancing, avoiding large gatherings) if they did not trust public health organizations to provide accurate information on the COVID-19 pandemic, and an individual's health literacy did not have an impact on the relationship between public health trust and compliance. These findings

contradict previous research, where health literacy was found to be a positive predictor of preventative measure engagement and individuals with higher health literacy were more likely to engage in these preventative measure behaviors (McCaffery et al., 2020; Naveed & Shaukat, 2021).

While there was a statistically significant negative correlation between public health organizations and compliance, it is possible that these relationships were being affected by an underlying uncertainty of COVID-19 information presented by public health organizations. This uncertainty may be attributed to the mixed messaging of the COVID-19 virus during the earlier stages of the pandemic. Due to the constantly changing information and general lack of knowledge on the symptomology, transmissibility, and appropriate safety actions presented by public health organizations, such as the CDC, individuals may trust public health organizations, but with a degree of skepticism that was not captured in the results. Skepticism was not a factor examined within the measures of the current study; therefore, the measures may not have been sensitive enough to detect these effects.

Hypothesis 2b

It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from healthcare providers and compliance to COVID-19 health precautions.

This hypothesis was not supported by the findings from the current study. When examining trust in healthcare providers and health literacy scores, health literacy was not significantly related to participants level of compliance to precaution measures. However, lower levels of trust in healthcare providers were significantly related to greater compliance to engage in precaution measures. The interaction effect of health literacy and healthcare providers on

compliance was also found to be non-significant, indicating that an individuals' health literacy had no notable influence on the relationship between healthcare provider trust and compliance. This finding, again, goes against previous literature that indicated that higher levels of health literacy is indicative of greater levels of compliance to safety precautions (McCaffery et al., 2020).

Similarly to Hypothesis 2a, one possible explanation for these results is that these relationships were being affected by an underlying uncertainty of COVID-19 information presented by healthcare providers. Recently, news outlets have been reporting that some healthcare providers have been spreading false and unverifiable COVID-19 information to their patients (Brumfiel, 2021). Due to healthcare providers' extensive training in medicine, many individuals trust their clinical judgment and health recommendations. However, when a handful of healthcare providers are spreading false information on COVID-19, this erodes the trust placed on the providers. While individuals may somewhat trust their provider, they may do so with a level of skepticism, which was again not a factor examined within the current study.

Hypothesis 2c

It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from liberal media outlets and compliance to COVID-19 health precautions.

This hypothesis was not supported by the findings from the current study. Results indicated that health literacy was not significantly related to individuals' compliance to safety precautions; however, lower levels of liberal media outlet trust was significantly related to greater precaution compliance. The interaction effect of health literacy and liberal media outlets on compliance was found to be non-significant, indicating that an individuals' health literacy had

no notable influence on the relationship between compliance and trust in liberal media outlets. This finding, again, goes against previous literature that indicated that higher levels of health literacy is indicative of greater levels of compliance to safety precautions (McCaffery et al., 2020).

Similarly to Hypotheses 2a and 2b, it is possible that these relationships were being affected by an underlying uncertainty of COVID-19 information presented by liberal media outlets. The constantly changing information, general lack of knowledge, and the mixed messaging of the COVID-19 virus during the earlier stages of the pandemic could bring a degree of skepticism in the information presented by liberal media outlets. While these individuals may somewhat trust liberal media outlets, the unexamined factor of skepticism could be influencing the findings within this hypothesis.

Hypothesis 2d

It is hypothesized that greater health literacy will strengthen the relationship between COVID-19 information from conservative media outlets and compliance to COVID-19 health precautions.

This hypothesis was supported by the findings within the current study. An exploration of trust in conservative media outlets and health literacy scores found that both variables were not significantly related to individuals' compliance to COVID-19 safety precautions. However, the interaction effect of health literacy and conservative media outlets on compliance was found to be significant. This finding indicates that individuals were more likely to engage in COVID-19 precautions (e.g., wearing masks, social distancing, avoiding large gatherings) if they had higher levels of health literacy and lower levels of trust in conservative media outlets to provide accurate information on the COVID-19 pandemic.

This finding aligns with previous research by Ali and colleagues (2020) that indicated that the messaging of the perceived risks of the COVID-19 pandemic seems to be polarized based on media outlets' political views. Individuals who relied on conservative media outlets (e.g., Fox News) endorsed beliefs and statements that suggested a smaller perceived risk of COVID-19. The perceived risk and severity of a virus plays an important role in individuals' likelihood of engaging in precautionary safety measures. Those who believe or perceived a disease or virus as a greater risk to their health, greater chances of contracting the disease, or greater chances of spreading the disease to their family members were more likely to engage in preventative measures (Bish & Michie, 2010). It is also noted within the literature that health literacy was a statically significant positive predictor of preventative measure engagement, and those who displayed lower levels of health literacy were more likely to support COVID-19 misinformation and less likely to engage in these preventative health behaviors (McCaffery et al., 2020; Naveed & Shaukat, 2021).

Limitations

It is important to note that the current study utilizes a cross-sectional research design and does not experimentally manipulate any variables. Results are intended to systematically highlight obstacles and possible mitigating variables that public health officials and researchers are faced with during the COVID-19 pandemic. Therefore, causal inferences cannot be extrapolated from the data provided within this manuscript.

Concerning study design, a portion of the survey was created to measure individual's level of trust in four different mediums in which individuals receive information relating to the COVID-19 pandemic. Factors such as the heavy politicization of COVID-19 and underlying skepticism of the various mediums in which individuals received COVID-19 information was

not accounted for within the measures and, therefore, may not entirely capture respondent's true attitudes towards those sources of information. The data collection procedures of the current study did not allow the researcher to factor in the timing of data collection for the variable functional impairment. Respondents were asked to retrospectively report their level of impairment during the earlier stages of the pandemic and recall these events after two years, which could have been misremembered or influenced by their current functional state. Respondents may have underreported their true level of functional impairment, which could potentially skew that set of results.

The use of an online survey also includes the potential for undercoverage and voluntary response biases. Voluntary response bias could potentially skew the data set by underreporting individuals who are disinterested in COVID-19. Also, the external validity for this study is limited given the homogeneity of the sample was largely Caucasian (82.54%) and individuals who were vaccinated (76.98%). Therefore, the sample is not representative of the general populations functional impairment and compliance to engage in preventative measures.

Finally, while three of the five measures employed within the study have not been formally validated by the academic community, these instruments were obtained from a database compiled by the NIH Office of Behavioral and Social Sciences Research (OBSSR). All measures included in this database were selected from highly credible academic institutions. In addition, the principal investigator thoroughly vetted and scrutinized each instrument to ensure they would produce valid and reliable data. It is pertinent to note that these instruments were swiftly developed and distributed to researchers in an effort to collect data in a timely manner on the public health crisis that is the COVID-19 pandemic.

Conclusion and Future Directions

This paper set out to examine two specific aims: to investigate the effect of receiving the COVID-19 vaccine on the relationship between COVID-19 related anxiety and functional impairment, and to investigate the effect of an individual's health literacy on the relationship between their source of COVID-19 information and compliance to COVID-19 safety measures. The results of this study revealed that an individual's vaccination status did not significantly moderate the relationship between COVID-19 related anxiety and impairment scores. This discovery contrasts with previous research that elevated COVID-19 anxiety was associated with a decrease in quality of life and receiving the COVID-19 vaccine diminished individuals' COVID-19 related anxiety (Babicki et al., 2021; Hansel et al., 2022; Perez-Arce et al., 2021).

The findings from this study also uncovered that within three models (e.g., examination of public health organizations, healthcare providers, and liberal media outlets) an individual's health literacy did not significantly moderate the relationship between the source of COVID-19 information and compliance to safety measures. These discoveries also contrast with previous research where individuals with higher health literacy were more likely to engage in preventative measures (McCaffery et al., 2020). However, within the fourth model, health literacy significantly moderated the relationship between trust in conservative media outlets and compliance to safety measures. This finding suggests that those who had high health literacy and lower levels of trust in conservative media outlets displayed greater compliance to COVID-19 safety precautions.

The results previously mentioned within this paper counter a great deal of findings within other academic studies that examined the impact of COVID-19 on individual's functioning and their level of compliance to engage in safety measures. Therefore, in order to reduce disruption

caused by the COVID-19 pandemic and build our understanding of effective solutions should the world be faced with a similar health crisis in the future, it is important for researchers to continue to examine the obstacles of safety measure compliance and factors that can mitigate individuals' anxiety levels.

References

Ali, S. H., Foreman, J., Tozan, Y., Capasso, A., Jones, A. M., & DiClemente, R. J. (2020). Trends and predictors of COVID-19 information sources and their relationship with knowledge and beliefs related to the pandemic: Nationwide cross-sectional study. *JMIR Public Health and Surveillance*, *6*(4), 1–15. http://dx.doi.org/10.2196/21071

Babicki, M., Malchrzak, W., Hans-Wytrychowska, A., & Mastalerz-Migas, A. (2021). Impact of vaccination on the sense of security, the anxiety of COVID-19 and quality of life among Polish. A nationwide online survey in Poland. *Vaccines*, *9*(12), 1–14. https://doi.org/10.3390/vaccines9121444

Bish, A., & Michie, S. (2010). Demographic and attitudinal determinants of protective behaviours during a pandemic: A review. *British Journal of Health Psychology*, *15*(4), 797–824. https://doi.org/10.1348/135910710X485826

Brumfiel, G. (2021, November 4). *A doctor spread COVID misinformation and renewed her license with a mouse click*. NPR. https://www.npr.org/sections/health-shots/2021/11/04/1051873608/a-doctor-spread-covid-misinformation-and-renewed-her-license-with-a-mouse-click

Cascella, M., Rajnik, M., Aleem, A., Dulebohn, S. C., & Di Napoli, R. (2022). *Features, evaluation, and treatment of coronavirus (COVID-19)*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK554776/

Centers for Disease Control and Prevention. (2021, November 4). *Basics of COVID-19*. Retrieved February 15, 2022, from https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19/basics-covid-19.html

Greer, M. L., Sample, S., Jensen, H. K., McBain, S., Lipschitz, R., & Sexton, K. W. (2021). COVID-19 is connected with lower health literacy in rural areas. *Studies in Health Technology and Informatics*, *281*, 804–808. https://doi.org/10.3233/SHTI210286

Guo, C., Chan, S. H. T., Lin, C., Zeng, Y., Bo, Y., Zhang, Y., Hossain, S., Chan, J. W. M., Yeung, D. W., Lau, A. K. H., & Lao, X. Q. (2021). Physical distancing implementation, ambient temperature and COVID-19 containment: An observational study in the United States. *The Science of the Total Environment*, *789*, 1–8. https://doi.org/10.1016/j.scitotenv.2021.147876

Hansel, T. C., Saltzman, L. Y., Melton, P. A., Clark, T. L., & Bordnick, P. S. (2022). COVID-19 behavioral health and quality of life. *Nature Portfolio*, *12*(1), 1–10. http://dx.doi.org.ezproxy.emich.edu/10.1038/s41598-022-05042-z

Kleinke, K. (2017). Multiple imputation under violated distributional assumptions: A systematic evaluation of the assumed robustness of predictive mean matching. *Journal of Educational and Behavioral Statistics*, *42*(4), 371–404. https://doi.org/10.3102/1076998616687084

Kouzy, R., Abi Jaoude, J., Kraitem, A., El Alam, M. B., Karam, B., Adib, E., Zarka, J., Traboulsi, C., Akl, E. W., & Baddour, K. (2020). Coronavirus goes viral: Quantifying the COVID-19 misinformation epidemic on twitter. *Cureus*, *12*(3), 1–9. https://doi.org/10.7759/cureus.7255

Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: The PHQ–4. *Psychosomatics*, *50*(6), 613–621. https://doi.org/10.1016/S0033-3182(09)70864-3

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198–1202.

Lyu, W., & Wehby, G. L. (2020). Community use of face masks and COVID-19: Evidence from a natural experiment of state mandates in the US. *Health Affairs*, *39*(8), 1419–1425. https://doi.org/10.1377/hlthaff.2020.00818

McCaffery, K., Dodd, R., Cvejic, E., Ayre, J., Isautier, J., Copp, T., Bonner, C., Pickles, K., Nickel, B., Dakin, T., Cornell, S., & Wolf, M. (2020). Health literacy and disparities in COVID-19–related knowledge, attitudes, beliefs and behaviours in Australia. *Public Health Research & Practice*, *30*(4), 1–9. https://doi.org/10.17061/phrp30342012

Mundt, J. C., Marks, I. M., Katherine, S. M., & Greist, J. M. (2002). The Work and Social Adjustment Scale: A simple measure of impairment in functioning. *The British Journal of Psychiatry*, *180*(5), 461–464. http://dx.doi.org/10.1192/bjp.180.5.461

Naveed, M. A., & Shaukat, R. (2021). Health literacy predicts COVID-19 awareness and protective behaviours of university students. *Health Information & Libraries Journal*, 1–13. https://doi.org/10.1111/hir.12404

Norman, S. B., Hami Cissell, S., Means-Christensen, A. J., & Stein, M. B. (2006). Development and validation of an Overall Anxiety Severity and Impairment Scale (OASIS). *Depression and Anxiety*, *23*(4), 245–249. https://doi.org/10.1002/da.20182

Perez-Arce, F., Angrisani, M., Bennett, D., Darling, J., Kapteyn, A., & Thomas, K. (2021). COVID-19 vaccines and mental distress. *PLOS ONE*, *16*(9), 1–11. https://doi.org/10.1371/journal.pone.0256406

Rader, B., White, L. F., Burns, M. R., Chen, J., Brilliant, J., Cohen, J., Shaman, J., Brilliant, L., Kraemer, M. U. G., Hawkins, J. B., Scarpino, S. V., Astley, C. M., & Brownstein, J. S.

(2021). Mask-wearing and control of SARS-CoV-2 transmission in the USA: A cross-sectional study. *The Lancet Digital Health*, *3*(3), 148–157. https://doi.org/10.1016/S2589-7500(20)30293-4

Terlizzi, E. P., & Villarroel, M. A. (2020). *Symptoms of generalized anxiety disorder among adults: United States 2019* (No. 378). National Center for Health Statistics. https://www.cdc.gov/nchs/data/databriefs/db378-H.pdf

World Health Organization. (n.d.-a). *Coronavirus disease (COVID-19)*. Retrieved February 15, 2022, from https://www.who.int/health-topics/coronavirus#tab=tab_1

World Health Organization. (n.d.-b). *WHO coronavirus (COVID-19) dashboard*. Retrieved February 15, 2022, from https://covid19.who.int/

World Health Organization. (2021, October 1). *Advice for the public: Coronavirus disease (COVID-19)*. Retrieved February 15, 2022, from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Xu, H., Gan, Y., Zheng, D., Wu, B., Zhu, X., Xu, C., Liu, C., Tao, Z., Hu, Y., Chen, M., Li, M., Lu, Z., & Chen, J. (2020). Relationship between COVID-19 infection and risk perception, knowledge, attitude, and four nonpharmaceutical interventions during the late period of the COVID-19 epidemic in China: Online cross-sectional survey of 8158 adults. *Journal of Medical Internet Research*, *22*(11), 1–19. https://doi.org/10.2196/21372

APPENDICES

Appendix A: IRB Approval

IRB #: UHSRC-FY21-22-155
Title: Perceptions of COVID-19 and its Impact on Mental Health
Creation Date: 1-21-2022
End Date:
Status: Approved
Principal Investigator: Alexander Karl
Review Board: University Human Subjects Review Committee
Sponsor:

Study History

Submission Type	Review Type	Decision
Initial	Exempt	Exempt

Key Study Contacts

Member Natalie Dove	**Role** Co-Principal Investigator
Member Alexander Karl	**Role** Principal Investigator
Member Alexander Karl	**Role** Primary Contact

Appendix B: Overall Severity and Impairment Scale (OASIS)

The following items ask about anxiety and fear. For each item, select the number for the answer that best describes your experience over the past week.

1. In the past week, how often have you felt anxious?
   - 0 = No anxiety in the past week.
   - 1 = Infrequent anxiety. Felt anxious a few times.
   - 2 = Occasional anxiety. Felt anxious as much of the time as not. It was hard to relax.
   - 3 = Frequent anxiety. Felt anxious most of the time. It was very difficult to relax.
   - 4 = Constant anxiety. Felt anxious all of the time and never really relaxed.

2. In the past week, when you have felt anxious, how intense or severe was your anxiety?
   - 0 = Little or None: Anxiety was absent or barely noticeable.
   - 1 = Mild: Anxiety was at a low level. It was possible to relax when I tried. Physical symptoms were only slightly uncomfortable.
   - 2 = Moderate: Anxiety was distressing at times. It was hard to relax or concentrate, but I could do it if I tried. Physical symptoms were uncomfortable.
   - 3 = Severe: Anxiety was intense much of the time. It was very difficult to relax or focus on anything else. Physical symptoms were extremely uncomfortable.
   - 4 = Extreme: Anxiety was overwhelming. It was impossible to relax at all. Physical symptoms were unbearable.

3. In the past week, how often did you avoid situations, places, objects, or activities because of anxiety or fear?
   - 0 = None: I do not avoid places, situations, activities, or things because of fear.
   - 1 = Infrequent: I avoid something once in a while, but will usually face the situation or confront the object. My lifestyle is not affected.
   - 2 = Occasional: I have some fear of certain situations, places, or objects, but it is still manageable. My lifestyle has only changed in minor ways. I always or almost always avoid the things I fear when I'm alone, but can handle them if someone comes with me.
   - 3 = Frequent: I have considerable fear and really try to avoid the things that frighten me. I have made significant changes in my lifestyle to avoid the object, situation, activity, or place.
   - 4 = All the Time: Avoiding objects, situations, activities, or places has taken over my life. My lifestyle has been extensively affected and I no longer do things that I used to enjoy.

4. In the past week, how much did your anxiety interfere with your ability to do the things you needed to do at work, at school, or at home?
   - 0 = None: No interference at work/home/school from anxiety
   - 1 = Mild: My anxiety has caused some interference at work/home/school. Things are more difficult, but everything that needs to be done is still getting done.
   - 2 = Moderate: My anxiety definitely interferes with tasks. Most things are still getting done, but few things are being done as well as in the past.

3 = Severe: My anxiety has really changed my ability to get things done. Some tasks are still being done, but many things are not. My performance has definitely suffered.
4 = Extreme: My anxiety has become incapacitating. I am unable to complete tasks and have had to leave school, have quit or been fired from my job, or have been unable to complete tasks at home and have faced consequences like bill collectors, eviction, etc.

5. In the past week, how much has anxiety interfered with your social life and relationships?
0 = None: My anxiety doesn't affect my relationships.
1 = Mild: My anxiety slightly interferes with my relationships. Some of my friendships and other relationships have suffered, but, overall, my social life is still fulfilling.
2 = Moderate: I have experienced some interference with my social life, but I still have a few close relationships. I don't spend as much time with others as in the past, but I still socialize sometimes.
3 = Severe: My friendships and other relationships have suffered a lot because of anxiety. I do not enjoy social activities. I socialize very little.
4 = Extreme: My anxiety has completely disrupted my social activities. All of my relationships have suffered or ended. My family life is extremely strained.

Appendix C: John Hopkins University COVID-19 Community Response Survey

How much do you trust the following sources to provide accurate COVID-19 information?

a. Doctors or other health care providers
   1 = Not at all
   2 = Somewhat
   3 = Completely

b. Centers for Disease Control (CDC)
   1 = Not at all
   2 = Somewhat
   3 = Completely

c. CNN
   1 = Not at all
   2 = Somewhat
   3 = Completely

d. Fox News
   1 = Not at all
   2 = Somewhat
   3 = Completely

Appendix D: Precaution Compliance

Answer the following statements on a scale of 1-5 with 1 being “Never” and 5 being “Always”.

1 = Never
2 = Rarely
3 = Sometimes
4 = Often
5 = Always

1. When the COVID-19 pandemic first started, how often were you wearing masks in public places?

2. Currently, how often are you wearing masks in public places?

3. When the COVID-19 pandemic first started, how often were you socially distancing in public places?

4. Currently, how often are you socially distancing in public places?

5. When the COVID-19 pandemic first started, how often were you avoiding social gatherings in order to reduce COVID-19 risk?

6. Currently, how often are you avoiding social gatherings in order to reduce COVID-19 risk?

Appendix E: Work and Social Adjustment Scale (WSAS)

On a scale from 0 being "Not at all" to 8 being "Very severely", please rate how COVID-19 has impaired your ability to carry out the activities listed below.

0 Not at all	1	2 Slightly	3	4 Definitely	5	6 Markedly	7	8 Very severely

1. Because of COVID-19 my ability to work is impaired. '0' means 'not at all impaired' and '8' means very severely impaired to the point I can't work.

2. Because of COVID-19 my home management (cleaning, tidying, shopping, cooking, looking after home or children, paying bills) is impaired.

3. Because of COVID-19 my social leisure activities (with other people e.g. parties, bars, clubs, outings, visits, dating, home entertaining) are impaired.

4. Because of COVID-19, my private leisure activities (done alone, such as reading, gardening, collecting, sewing, walking alone) are impaired.

5. Because of COVID-19, my ability to form and maintain close relationships with others, including those I live with, is impaired.

Appendix F: COVID-19 Impact on Health and Wellbeing Survey (Health Literacy)

During a pandemic, it is important to understand how you receive and process health information. For each item, select the response for the answer that best describes your experience.

1 = Always
2 = Often
3 = Sometimes
4 = Occasionally
5 = Never

1. How often do you have someone help you read hospital materials?

2. Are you confident in filling out medical forms by yourself?

3. How often do you have problems learning about your medical condition because of difficulty understanding written information?

4. How often do you have a problem understand what is told to you about your medical condition?