Spring 5-1-2021

Social Environment Changes During COVID-19 Quarantine

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SOCIAL ENVIRONMENT CHANGES DURING COVID-19 QUARANTINE

by
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A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the
requirements of the Sally McDonnell Barksdale Honors College

Oxford
May 2021

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DEDICATION**:**

This project would not be possible without the loving support provided by my parents Miguel y

Nelida. Their unwavering support calmed any doubts and made any challenge seem conquerable.

¡Muchisimas gracias!

ACKNOWLEDGEMENTS:

ABSTRACT

AILEEN JIMENEZ: Social Environment Changes during COVID-19 Quarantine

(Under the direction of Dr. John Young)

The purpose of this research project is to understand perceptions of the psychological, behavioral, and social impacts of COVID-19. Students at the University of Mississippi were invited to participate in an online questionnaire administered through Qualtrics. The questionnaire was composed of questions concerning health behaviors, including questions from the Depression, Anxiety and Stress Scale-21, Perceived Vulnerability to Disease Scale, Fear of Coronavirus-19 Scale, and the World Health Organization's COVID-19 Snapshot Monitoring study. 274 students participated in the study. Overall, the results of this study suggested moderate distress across the sample, differences in sleep, exercise, and alcohol consumption during quarantine conditions, and minimal financial and housing disruptions. Results from this project can help target ways to increase adherence to health recommendations related to COVID-19 and provide insight into building resilience and preparedness for potential future crises.

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<u>**Introduction:**</u>

<u>**Background**</u>**:**

      The outbreak of the novel coronavirus (referred to as COVID-19 hereafter) originated in

Wuhan, China in late December of 2019, and from there spread rapidly throughout the

world. On January 31, 2020, in response to the new outbreak and quick spread of COVID-19,

the Secretary of Health and Human Services declared a public health emergency (White House,

2020). By March, the virus had spread to 85 countries and over 57,655 cases had been reported

worldwide (World Health Organization 2020). Finally, on March 11, 2020, the World Health

Organization established COVID-19 a pandemic. The declaration of the virus as a pandemic

prompted government officials to establish a nationwide quarantine in March of 2020 to prevent

and to slow the transmission of the disease. At the time of writing, the number of COVID-19

cases, as estimated by the Center for Disease Control and Prevention (CDC), amounted to

27,127,858 since the first outbreak reported in late January 2020. Of these 27,127,858 cases the

Center for Disease Control and Prevention reports 470,110 deaths, corresponding to a 1.73%

mortality rate. The estimated cumulative incidence rate of COVID-19 cases in the United States

reported to the CDC per 100,000 is 8,276.

<u>**About the virus:**</u>

      COVID-19 is a single-stranded RNA virus that targets the lungs (Wang et al. 2020).

COVID-19 is transmitted via direct contact, which includes droplets produced when coughing,

sneezing, or talking. Physical proximity is an important factor when considering modes of

transmission and prevention because, in order for the virus to spread, individuals must be in close contact. Individuals with pre-existing health conditions or compromised immune systems are most vulnerable to contracting the virus (Kowalik et al. 2020).

Effects of virus outbreak: Quarantine and prevention efforts

Given the rapid spread of the virus, worries about contracting the virus quickly increased, leading to many public health efforts to contain transmission. The primary method of mitigating the spread of a pathogenic agent is control (McGraw Hill, 2013), and one of the most effective public health interventions to establish transmission control is quarantine. Thus, in response to the growing pandemic threat, the government issued recommendations for a nationwide quarantine for individuals who could potentially be infected with COVID-19 and capable of transmission to someone else. Quarantine involves the temporary separation and restriction of movement of individuals exposed or potentially exposed to a contagious disease to prevent the introduction and spread of a communicable disease (CDC, 2017). Individuals with any signs of sickness or knowledge of possible exposure to the disease were urged to stay at home and isolated. Additionally, guidance was issued to the entire populace to limit nonessential outings as much as possible, particularly gatherings of more than 10 people.

Additional prevention efforts focus on increasing compliance with sanitation, social distancing, and face mask guidelines. Social distancing guidelines recommend that individuals remain at a distance of 6 feet in an effort to decrease transmission rates associated with spread via close contact. The CDC also recommends that individuals wear face masks to slow transmission and prevent any droplets produced from coughing, sneezing, or talking from being passed to other individuals. Proper sanitation and hygiene are also important measures to slow

transmission; thus, individuals are encouraged to wash their hands with soap or hand-sanitizer frequently.

While the government issued a nationwide quarantine, adherence to quarantine recommendations and health guidelines remained voluntary, which introduced considerable variability in behavioral responses to COVID-19 (Betsch, 2020). Early reviews of quarantine and its adherences found that people were more willing to follow recommendations to help alleviate strain on the healthcare system and were even more motivated to do so when they perceived that their efforts helped vulnerable groups (Betsch, 2020). Early suggestions on how to promote adherence to recommendations outlined by the CDC and other credible sources primarily focused on establishing preventative behaviors as a social norm. An article from the University of Erfurt Germany, for example, explained in some detail how knowledge of others contributing to public efforts typically encourages others to respond similarly and restrict contact with motivation to aid the greater good (Betsch, 2020).

National efforts to control the virus contributed to increasing fear of contracting the virus. This fear influenced people's attitudes and behaviors concerning COVID-19. With increasing cases and ambiguity over means of transmission and potential prevention/intervention efforts on the horizon, panic quickly spread, resulting in disproportionate (often pseudoscientific) responses in some individuals. Increased stress responses included panic buying and hoarding of personal protective equipment (Garfin, Silver & Holman, 2020; "Coronavirus: Demand for Face Masks," 2020). Furthermore, these responses yielded broad negative ramifications, such as shortages of some staple household items and an increased burden on the healthcare system due to the lack of sufficient protective equipment (Garfin, Silver & Holman, 2020). Overall, there are many other

potential negative consequences of extended quarantine, which are reviewed in more detail below.

<u>Potential effects of quarantine:</u>

A primary concern of quarantine is the subsequent social disruption which can increase feelings of social isolation. Researchers define social isolation as "a state in which the individual lacks a sense of belonging socially, lacks engagement with others, has a minimal number of social contacts and they are deficient in fulfilling and quality relationships'' (Nicholson, 2009 p 137). Separation from friends and family members for an extended period of time under quarantine conditions can also lead to loneliness. While both loneliness and social isolation can result from quarantine, it is important to understand the difference between the two and thus the implications of each. Studies found that social isolation refers to the lack of social contact, whereas loneliness is defined as the "dissatisfaction with a discrepancy between desired and actual social relationships" (Peplau & Perlman, 1982). Despite one being a subjective measure and the other an objective measure, previous research shows that both actual and perceived social isolation can lead to poor health behaviors and increased mortality (Holt-Lunstad, 2015). Consideration of the impact of these conditions on individual health decision-making therefore became much more critical in response to the pandemic and potential need for quarantine. Social connections also promote a broader sense of community and support that contribute positively to mental and physical health, thus a lack of social interaction may have serious effects (Uchino, 2006; Holt-Lunstad, 2015). Extensive research on the general effects of social isolation outlines potential negative health behaviors that tend to increase in individuals who feel lonely and/or are socially isolated. Findings associate loneliness and social isolation with poor health behaviors

including loneliness and social isolation are associated with poorer health behaviors including smoking, physical inactivity, and poorer sleep (Cacioppo et al., 2002; Hawkley, Thisted, & Cacioppo, 2009; Theeke, 2010). Previous research studying the effects of social isolation suggests negative health behaviors associated with a lack of social interaction, especially in the elderly (Nicholson, 2012). Researchers associate social isolation with a higher risk of smoking, heavy drinking, and lack of exercise, often leading to sedentary behaviors, weight gain, and obesity (Eng et al., 2002; Hanson, 1994; Nicholson 2012). Overall, the implications of decreased social interaction are many, as social interactions are beneficial for psychological and physical health in addition to increased life expectancy (Holt-Lunstad et al., 2010; House, Landis, & Umberson, 1988; Shor, Roelfs & Yogev, 2013).

      While social isolation is of great concern and a potential consequence of quarantine, it is also not a guaranteed outcome. An article on "The Mental Health Consequences of COVID-19 and Physical Distancing" noted that while "loneliness is inevitable as populations physically and socially isolate" the use of technology can bridge social distance (Galea et al., 2020). The rise of new technologies and wider availability of high-speed internet, for example, potentially allow useful means of sustaining social contact and preventing the negative impact of isolation and/or loneliness. This is theoretically relevant to what researchers have posed as the most central reason for the negative impact of isolation (i.e., deficient tangible social support and connection), in that online platforms may help individuals stay connected and can simulate the support and connection achieved from social interactions (Holt-Lunstad, 2015). Video calls can help replicate normal structures and recreational and occupational activities seen prior to the pandemic and the nationwide quarantine (Galea et al., 2020). This use of technology may help mitigate feelings of social isolation and enhance contact and communications, which is critical given the findings on

the negative health impacts of isolation (particularly in an extended quarantine situation).

While quarantine and social isolation are associated with an increased risk of developing psychopathology, the benefit of technology should be noted. For example, telehealth allows for individuals to continue receiving their current mental health services despite the cessation of in-person appointments. Similarly, social media and other internet platforms allow for a sense of community and connection. Recent research on the mental health consequences of COVID-19 and physical distancing demonstrates the utility of these platforms in simulating regular contact and allowing individuals to share details relating to their needs and well-being (Galea et al. 2020).

Effects of quarantine on employment and income:

The temporary closing of many establishments and businesses resulting from mandated stay-at-home orders also led to an increase in unemployment rates. By April 16, 2020, more than 22 million Americans filed for unemployment aid, a staggering amount previously only seen during the Great Depression (Long Washington Post, 2020). As of May 2020, the job toll hit 38 million, reflective of ongoing job loss and serious implications to worldwide economic systems (Beilfuss, 2020). Understanding the extent and influence of unemployment is also important due to its association with increased individual financial strain (and therefore stress), which in turn has a demonstrable impact on health decision-making (Betsch, 2020). Additionally, this drastic decrease in employment rates raises concerns that extend beyond the economic implications, as research outlines other negative implications of job loss and unemployment in terms of emotional duress (e.g., Jahoda, 1981; 1982; Zechman et al., 2019).

Studies analyzing the role of deprived psychological needs associated with job loss found that employment provides a sense of collective purpose (mastery and pleasure), social contact, activities, and a time structure which frames people's lives and fosters mental health (Zechman et al., 2019). Moreover, for most people employment extends beyond the simple provision of money and fulfills essential psychological needs, including but not limited to autonomy and competence (Zechman et al., 2019). Unemployment can thus be stressful, requiring adjustment and frequently impairing subjective well-being and mental health (McKee-Ryan et al., 2005; Paul & Moser, 2009; Zechman et al., 2019). If unemployment leads to psychological needs not being met, individuals are at risk for mental health effects, such as depression and anxiety (Jahoda, 1981; 1982). These risks were greatly amplified with the wave of unemployment associated with pandemic conditions, which is informative for many public health initiatives developed to combat the spread of COVID-19.

A recent study on the mental health consequences of COVID-19 and physical distancing establishes the importance of developing and implementing routines (such as those typically associated with routine work and workplace engagement). The article highlights the impact that a lack of scheduling has on mental health and socialization (Galea et al., 2020). While the article refers to these as a result of COVID-19 in general, the negative impact can be extended to describe the effects of job loss as both a lack of scheduling and socialization resulting from unemployment more generally. Likewise, a survey conducted in 1999 by the National Research Council suggests the benefits of employment extend beyond income, as roughly 70 percent of respondents indicated a desire to continue working even if they "were to get enough money to live as comfortably as [they wanted] for the rest of [their lives]" (NRC, 1999 as referenced by Landy & Conte, 2003). On its own, this statistic speaks to the importance of work, and the time

period in which those data were collected (i.e., pre-worldwide pandemic conditions and a period of economic prosperity in the United States) suggests that this importance is likely free of attention to context. Overall, the risk of unemployment and financial losses intensifies the negative emotions individuals experience concerning a disease outbreak (Van Bortel et al., 2016 as referenced by Ho, Chee, & Ho, 2020), thus making consideration of employment status very relevant to understanding individual responses to COVID-19.

Effects of quarantine on mental health:

From social isolation to increased environmental stressors, quarantine provides optimal conditions for developing some form of psychopathology. Research from previous pandemics communicates the effects of pandemics on mental health (e.g. Chen & Hong, 2010; Hawryluck, Gold, Robinson, Pogorski, Galea, & Styra, 2004; Ho, Chi, & Ho, 2020; Taha, Matheson, Cronin, & Anisman, 2014). Pandemics can induce psychological reactions that lead to maladaptive behaviors, emotional distress and defensive responses, especially among those individuals who are prone to psychological problems (Taylor, 2019 as referenced by Cullen, Gulati, & Kelly, 2020). For example, research from the H1N1 pandemic of 2009 communicates a relationship between daily stressors and increased anxiety in individuals with low tolerance to uncertainty (Chen & Hong, 2010). Furthermore, studies provide evidence of high prevalence of psychological distress, including PTSD and depressive symptoms, associated with long periods of quarantine (Hawryluck et al., 2004; Ho, Chi, & Ho, 2020).

Attention to mental health changes is important as increased financial strain, lack of structure, and limited social contact not only increase the likelihood of developing some form of psychopathology but also exacerbate current mental health problems. In short, the implications

of mental health issues are serious as they increase mortality and lead to "poorer physical health outcomes than [those of] the general population" (Rodgers, Dalton, Harden, Street, Parker & Eastwood, 2018).

Anxiety and depression:

Anxiety is defined as a negative mood state accompanied by bodily symptoms such as increased heart rate, muscle tension, a sense of unease, and apprehension about the future (Barlow, 2002). Individuals with anxiety disorders are excessively fearful, anxious, or avoidant of perceived threats in the environment or internal to oneself (Kogan et al., 2016). Anxiety disorders are highly prevalent with median lifetime prevalence of 14.3% and a 12-month prevalence of 8.3% (Kessler et al., 2009). The International Classification of Diseases (ICD-11) outlines specific requirements that must be met for an individual to qualify for an anxiety diagnosis, such as persistent symptoms over several months where worry is present for more days than not (Kogan et al., 2016). Symptoms must also be "sufficiently severe to result in significant distress and result in significant impairment in personal, family, social, and educational, occupation, or other important functioning" (Kogan et al., 2016). Individuals experiencing anxiety often perceive heightened levels of danger or threat in situations that do not warrant such reactions. Anxiety can be further categorized as generalized anxiety, social anxiety, or somatic anxiety. For the purposes of this study, however, the use of the word *anxiety* refers to any of its forms.

Also important when assessing anxiety is depression, as the role of negative affect often renders the two comorbid. Beck defines depression by the following five attributes: alteration in mood, negative self-concept, regressive wishes, vegetative changes, and changes in activity level (Beck & Alford, 2009). Approximately 16 million Americans suffer from moderate or severe

depression, a medical condition that affects mood, cognitive and physical symptoms (Pratt and Brody, 2014 as referenced by Bradley et al., 2017). Moreover, the American Psychiatric Association estimates lifetime prevalence of developing major depressive disorder to be 5-12% in males and 10-25% in females (American Psychiatric Association, 2000).

Given the increased risk for developing anxiety or depression during a stressful period, such as a pandemic threat, anxiety and depression are important variables to measure when assessing psychological reactions to COVID-19. Moreover, extensive research on the prevalence of anxiety and depression indicates the importance of assessing depression and anxiety in college students more generally, as these individuals are at higher risk for both (e.g. Kraft et al., 2019; Ramon-Arbues et al., 2020). The comorbidity of anxiety and depression presents another reason for studying these constructs. Extensive research on psychopathology supports that both depression and anxiety share certain features, conveying that their symptoms operate on a continuum (Brown, Chorpita, & Barlow, 1998; Clark & Watson, 1991; Kendall & Watson 1989). Clark and Watson outline the relationship between anxiety and depression in their tripartite model, which describes the interplay of negative affect, physiological hyperarousal, and an absence of positive affect in individuals presenting with anxiety and/or depression (Clark & Watson, 1991). Furthermore, there is support for four generally overlapping symptoms of depression and anxiety (i.e., sleep disturbances, fatigue, concentration problems, and restlessness), which exhibits the connections and comorbidity of the two disorders (Boschloo, 2018). Due to this comorbidity, it is important to consider *both* anxiety and depression when assessing mental health (as the current study does in connection to pandemic conditions).

Gaps in Literature:

Given the novelty of the COVID-19 virus, little is known about its psychosocial effects to this point. Despite tremendous, rapid progress in this area over the past year in response to global disease-related threat, researchers have continuously outlined the need to better understand public perception of risk, protective and preparedness behaviours, public trust, knowledge and misinformation (Betsch, 2020; Galea et al., 2020). The existing literature outlines details about the virus's size and methods of transmission, among other characteristics, but little to no evidence exists regarding the psychological and behavioral impact of the virus, specifically under quarantine conditions. Furthermore, the psychological factors that contribute to the spread of a pandemic and the accompanying social disruption have received insufficient attention (Taylor, 2019) and have clear implications for radically different rates of proliferation across different nations. This lack of attention to mental health and behavioral factors related to decision-making may be due at least in part to the fact that previous research-related responses to pandemics generally focused almost exclusively on the physical manifestations of the outbreak and less on mental health consequences or means of behavioral prevention (Ho, Chee, & Ho, 2020). Additionally, the drastic increase in screen time associated with the shift to technology in order to supplant physical presence in social settings is also of concern given the findings regarding social isolation, loneliness, and potential negative ramifications of increased media exposure regarding COVID-19 (Garfin et al., 2020).

Collectively, the literature reviewed suggests that inadequate data on the psychological and behavioral effects of COVID-19 exist. Research from past outbreaks of infectious diseases has also highlighted the importance of conducting further research on the psychological effects of widespread disease (albeit in a much less ubiquitous context than the current conditions).

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Some direction for future study in this domain can be derived from existing research on the impact of social isolation, which shows deleterious effects in general but few studies specific to lengthy quarantine or the need for permanent lifestyle changes. Furthermore, the sparse literature on the mental health consequences of epidemics typically relates more to constructs representing the *sequelae* of the disease itself than to social distancing or other behavioral responses that could affect decision-making (Galea et al., 2020). Understanding people's psychological and behavioral reactions to the virus is an important component in developing strategies to help individuals cope and to mitigate the spread of the virus at both individual and societal levels. Therefore, the purpose of this research project is to understand more about individual perceptions of the psychological, behavioral, and social impacts of COVID-19. The current study focuses on assessing changes to health behaviors, compliance with health guidelines, and perception of severity of the virus from a psychological perspective, accounting for individuals' current symptoms of anxiety and depression.

Participants:

A total of 274 students at the University of Mississippi participated in this study. The only inclusion criteria were that participants were 18 years of age or older and enrolled as a student at the University of Mississippi (either graduate or undergraduate). All the students responding reported full-time status, although this was not a requirement for participation. 37.6% of the students were Freshman (n=103), 10.9% were Sophomores (n=30), 23.4% were Juniors (n=64), 21.9% were Seniors (n=60), 1.8% were Masters students (n=5), and 3.6% were pursuing a terminal degree (n=10). The average age of students who took the survey was 19.88 (SD = 3.60). The sample predominantly reported being female (n=203; 74.1%), White (n=236; 86.1%), and residents of the state of Mississippi (n=162; 59.1%). Other ethnicities reported included Hispanic (n=12; 4.4%), African American (n=11; 4.0%), Asian (n=8; 2.9%), and other (n=5; 1.8%). Of these, 5.8% of participants reported that they had previously been confirmed as having COVID-19 (n=16), 3.6% had contracted COVID-19 but were not tested/confirmed (n=10), and 74.1% reported no previous infection with COVID-19 (n=203).

Measures:

The questionnaire employed in the current study included items based on the COVID-19 Snapshot Monitoring study, abbreviated COSMO. The COSMO initiative was founded by the World Health Organization in collaboration with the University of Erfurt, Germany in early

March of 2020. The World Health Organization, WHO, is a specialized agency, established in April of 1948 with the main goal of directing and coordinating international health within the United Nations system. The WHO works in association with "the United Nations system, international organizations, civil society, foundations, academia, and research institutions" and currently includes 194 member states (World Health Organization, 2020). The development of the WHO's COSMO initiative resulted in international efforts related to COVID-19, many of which used the questionnaire or some derivative of such to facilitate national understanding of adherence to public health advice, behavioral reactions to pandemic conditions, and policy determinations. These efforts culminated in numerous publications on that basis (e.g., Alawadhi, Hossain, Bin Haidar, & Zein, 2020; Betsch, 2020; Betsch, Wieler, & Habersaat, 2020; Bohm, Lilleholt, Zettler, & COSMO Group, 2020; Sabat et al., 2020). The questions from the COSMO included in this study primarily related to health behaviors during quarantine, knowledge of the COVID-19, and changes due to the novel coronavirus.

This study also included questions related to depression and anxiety as measured by the Depression, Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995). The DASS-21, a 21-item measure, is widely used to assess depression, anxiety, and stress characteristics. It requires people to assign a ranking ranging from 0 to 3 for a variety of statements, with 0 corresponding to the lower end of the scale and 3 corresponding to the higher end of the scale. A higher score on the DASS-21 is indicative of more severe depression, anxiety, and/or stress. The DASS-21 was formulated as a way of measuring multiple dimensions of depression, anxiety, and stress simultaneously, and has demonstrated psychometric properties equivalent to a previous 42-item iteration of the measure in both clinical and non-clinical settings (Antony, Bieling, Cox, Enns, & Swinson, 1998). Since then, numerous studies have been conducted using college-age

samples to examine the instrument's psychometric properties (e.g., Clara et al., 2001; Crawford & Henry, 2003; Henry & Crawford, 2005; Page, Hooke, & Morrison, 2007; Tully et al., 2009; Osman, et al. 2012), all of which have yielded strong support for its usage, including adequate reliability and publication of specific norms for scoring (consistent with those initially posed by Lovibond & Lovibond, 1995).

Also included in the questionnaire was the Perceived Vulnerability to Disease (PVD) measure. The PVD is a 15-item Likert scale with ratings from strongly disagree to strongly agree. Numbers ranging from 1 to 7 are assigned to responses to quantify perceived vulnerability, where 1 indicates strongly disagree and 7 indicates strongly agree. Responses are summed to evaluate the degree of the respondent's perceived susceptibility to generally contracting a disease. Of the 15 items, roughly half are reverse-scored, and "higher scores indicate greater perceived vulnerability to disease" (Duncan et al., 2009). Prior to the development of the PVD, few instruments measured response to disease vulnerability, and none of those that accounted for anxiety also focused on infectious disease (Duncan, Schaller, & Park, 2009). Thus, the PVD was developed to measure "personal perception of susceptibility and emotional discomfort in the event of disease transmission" (Duncan, Schaller, & Park, 2009). Numerous studies have assessed the impact of both objective and subjective perceptions of vulnerability, determining that these perceptions impact outcomes with various implications in disease presentation (Curtis, Aunger, & Rabie, 2004; Schaller & Murray, 2008). These studies highlight the importance of measuring individual's perceptions of their vulnerability to disease. The questions included in the study from the PVD focused primarily on gauging people's perception of vulnerability and distress response to potential infection.

Finally, the Fear of Coronavirus-19 Scale (FCVS-19) was included. The FCVS-19 measures participants' fear of COVID-19. The scale requires participants to indicate their level of agreement with 7 statements using a five-point Likert-type scale. Answers included "strongly disagree", "disagree", "neither agree nor disagree", "agree", and "strongly agree". The minimum score possible for each question is 1 (strongly disagree) and the maximum is 5 (strongly agree). Once completed, the total score is calculated by adding up each item score. Scores range from 7 to 35, with higher scores indicating a greater fear of COVID-19. Previous research surrounding hypochondriasis and anxiety amidst infectious epidemic crises highlighted the importance of measuring psychological implications of COVID-19 and influenced the development of the Fear of Coronavirus-19 scale (Duncan et al., 2009; Pappas et al., 2009; Ropeik, 2004). This instrument was created in response to the lack of an appropriate psychometric instrument to measure fear related to COVID-19 specifically (Ahorsu et al., 2020), drawing on items from 30 other relevant measures that were revised by multiple expert panels to select those items that were most relevant. The Fear of Coronavirus-19 scale sought to address the psychological challenges resulting from COVID-19, such as stigmatization and discrimination. Moreover, it is important to understand people's fear surrounding COVID-19, as fear can impair the judgment of individuals' responses to the virus. Recent studies found that fear of COVID-19 predicted compliance in the pandemic, and established fear of COVID-19 as the only significant predictor of positive behavior change (e.g., social distancing, improved hand hygiene) among all predictor variables measured (Harper, et al. 2020).

<u>Procedure:</u>

Institutional review board approval was obtained prior to commencing the study. Participants were recruited through email, group messaging, and the University of Mississippi's

SONA pool system. Consent was obtained from each participant prior to beginning the survey, which was administered through Qualtrics. Those individuals who took the survey through SONA received class credit, but no other compensation was offered for taking the survey. No identifying information was collected from the participants. The data were collected across a six-month period, from May to November 2020. Participants' responses were analyzed using SPSS software.

Results

Perception and knowledge of virus (from COSMO)

In order to gauge participant's knowledge of COVID-19, the survey included a series of questions related to transmission and other characteristics of the virus. The majority of students reported both knowledge and awareness of the novel coronavirus, with 97.1% of participants indicating that they were aware of the novel coronavirus and its ability to be transmitted from person to person (n=266). While most indicated knowledge and awareness of the virus, 0.7% declared that they were unaware of the novel coronavirus (n=2) and 0.7% responded "don't know" to the question about COVID-19 transmission(n=2).

Economic and housing changes

Among the questions asked, participants were asked to report changes to employment, income, and/or housing. the questions asked, participants were asked to report changes to employment, income, and/or housing. Of those responding, the majority of people did not select any of the changes. Based on this information, it is inferred that 60.9% of the sample (n=167) did not experience housing or employment changes. On the other hand, 39.1% of participants (n=107) experienced a change to either their employment, income, and/or housing. Of those who reported experiencing one of the changes, 35.5% experienced changes to their employment status (n=38), 63.6% experienced changes to their housing situation (n=68), and 42.1% experienced changes to their income (n=45).

Social distancing and purposes of interaction

A series of questions related to social distancing habits and the nature of participants' outings were included. Questions were focused on developing a better understanding of the reason and frequency of participants' outings during quarantine. The following table summarizes the results.

Table 1: Social distancing

	Response:	Frequency	Percent
Did you leave your house regularly to go to work?	Yes	80	29.2%
	No	191	69.7%
In the past week, have you attended a gathering of more than 10 people?	Yes	103	37.6%
	No	168	61.3%
In the past week, have you been closer than 6 feet away from someone who does not live in your home?	Yes	232	84.7%
	No	40	14.6%

Social environment and support

In addition to responding to questions related to quarantine and social distancing habits, participants were asked a series of questions related to their social circles. These questions were meant to provide information on the size of social circles and the support received from those groups. Responses to the question relating to where participants were spending quarantine revealed that that 75.9% (n=208) spent quarantine with their family, 12.0% spent quarantine in their own house/apartment (n=33), and the rest indicated "other" (which included a variety of locations, including a combination of time spent in their own apartment and family home). The average household size was 3.91. When asked if people felt alone during quarantine, responses

varied, with many individual responses indicating the perception of social isolation. More thorough responses to questions concerning social support are summarized below.

Table 2: Social support

	Strongly disagree	Disagree	Somewhat disagree	Neither	Somewhat Agree	Agree	Strongly Agree
I felt supported by the people around me	2.2% (n=6)	2.2% (n=6)	2.2% (n=6)	3.6% (n=10)	13.1% (n=36)	28.8% (n=79)	40.5% (n=111)
I felt like I had people I could talk to.	2.2% (n=6)	4.0% (n=11)	4.0% (n=11)	0.7% (n=2)	10.9% (n=30)	28.1% (n=77)	40.5% (n=111)
I felt alone.	1.5% (n=4)	3.3% (n=9)	5.1% (n=14)	13.9% (n=38)	16.4% (n=45)	26.6% (n=73)	24.1% (n=66)
The people around me provided me with comfort	1.1% (n=3)	2.6% (n=7)	6.2% (n=17)	4.7% (n=13)	26.3% (n=72)	30.7% (n=84)	26.3% (n=72)
Technology made me feel connected to my friends/family	1.5% (n=4)	5.5% (n=15)	6.2% (n=17)	3.6% (n=10)	12.0% (n=33)	30.7% (n=84)	31.8% (n=87)

Personal contact with COVID-19

The survey also asked whether participants knew people in their immediate social environment who were or had been infected by COVID-19. Of those responding, 44.5% knew someone who had been confirmed as contracting COVID-19 (n=122), 2.9% knew someone who had contracted COVID-19 (n=8) but it had not been confirmed, 47.1% did not know someone who had contracted COVID-19 (n=129), and 3.3% responded "don't know" (n=9).

Perceived Vulnerability to Disease

Worry about contracting the virus was measured and further assessed using the Perceived Vulnerability to Disease (PVD) measure. When asked to rate how worried they were about the possibility of contracting COVID-19 (from not worried at all to extremely worried), 12.4% of participants were not worried at all (n=34), 35.8% were worried very little (n=98), 38.7% were somewhat worried (n=106), and 10.2% were extremely worried (n=28). Scores from the PVD ranged from 28 to 95, which indicated that the full range of possible scores was not represented by these data. Of the 274 respondents, 253 responded to the questions from the PVD, and the mean PVD score was 63.03 (SD=13.22).

Mental health and psychological services

The survey included questions aimed at measuring psychological responses to COVID-19. To better understand mental health habits among respondents, participants were asked whether they received mental health services. Of those responding, 69.3% had not received mental health services within the last 12 months (n=190) while 21.5% had (n=59). Of the 59 who had received mental health services within the last 12 months, only 52.5% (n=31) were still receiving those services. Fear of COVID-19 was also measured using the Fear of Coronavirus-19 Scale. The mean COVID Fear Score was 14.75 (SD=6.09).

Mental health questions focused on measuring depression and anxiety using the DASS-21. Student's responses show that stress is highest among the three, followed by depression, and anxiety. The mean scores on the depression (6.73; SD=6.22), anxiety (3.71; SD=4.36), and stress subscales (7.36; SD=5.62) were all categorized as being in the "mild" range of elevation in

comparison to published norms. This suggests that people's emotional states may have been negatively affected by COVID-19 and/or associated pandemic conditions.

Behavioral responses to COVID-19

Of most interest were behavioral responses to the pandemic, specifically changes to health behaviors. The survey included a series of questions related to health behaviors focused on changes to diet, exercise, sleep, alcohol consumption, and smoking habits. Participants were asked the same set of questions relating to health behaviors for two different time frames: during initial imposition of quarantine recommendations and currently (i.e., at the time of taking the survey). The averages of each health behavior were compared across both time points to see if any changes could be observed between health behaviors during quarantine and at the time of taking the questionnaire. On average, participants reported exercising 3.02 times a week during quarantine. At the time of taking the questionnaire, participants exercised an average of 2.91 times a week. While the question asked participants to report the number of times a week they exercised for 30 minutes or longer, some responses were reported in hours or minutes. To provide an estimate of the average frequency represented by these times, responses given in units of time were converted to minutes and divided by 30 to arrive at the upper limit of exercise occasions. Although this introduced some bias into the calculations it was equivalent between groups and thus did not affect the relative comparison between time points.

Another health behavior measured in the questionnaire was weekly alcohol consumption. On average, respondents consumed alcohol 1.31 times a week during quarantine and 0.60 times at the moment of taking the questionnaire. These findings illustrate a decrease in the amount of alcohol consumed, with participants consuming alcohol 2.18 times as often during quarantine

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than at the time of taking the questionnaire. Finally, the questionnaire assessed sleep difficulty

and changes people made to their diets. Participants were asked to rate the frequency of their

difficulty sleeping, positive diet changes, and negative diet changes on a scale of 1 to 3, 1

representing "never" and 3 representing "very often". The results from the questions about sleep

difficulty and diet changes are summarized below.

Table 3: Health behaviors

	Response:	Frequency
	1	13.5% (n=37)
Had difficulty sleeping	2	61.3% (n=168)
	3	15.0% (n=41)
	1	7.3% (n=20)
Made *positive* changes to their diet	2	71.2% (n=195)
	3	11.7% (n=32)
	1	5.5% (n=15)
Made *negative* changes to their diet	2	82.1% (n=225)
	3	2.6% (n=7)

Qualitative responses

The final question of the survey was qualitative, resembling a "free-response" where

participants were able to include comments. The question prompted them to share any additional

information about the way COVID-19 had affected their lives, or anything else they might want

to include (however tangentially related). These responses were aggregated to represent

commonly-reported ideas, which included five primary themes: 1) anecdotes about personal

experiences with the virus and other changes to health behaviors that were not specifically

mentioned in the survey; 2) elaboration on the impact of COVID-19 on use of technology,

engagement in exercise, and dietary practices; 3) fear for family members/friends with pre-

existing health conditions; 4) expressing disbelief or otherwise politicizing COVID-19; and 5)

expression of annoyance at the lack of compliance with public health recommendations that

many respondents witnessed in their environments. With regard to the first theme, many people

shared information regarding behaviors they found useful or ways they approached health

recommendations. Respondents whose comments fell under the second theme detailed the

impact of COVID-19 on their routines and specific changes they made to their lifestyles as a

result of the ongoing virus. Overall, these responses generally elucidated frustration with the

current pandemic threat and the subsequent lifestyle changes (i.e., regardless of the categorized

theme, these comments were predictably negative).

Discussion

This study focused on understanding the psychological, social, and behavioral impact of COVID-19 quarantine. Overall, the results from this study showed retrospective, self-reported changes to health behaviors during quarantine compared to after quarantine. Of the health behaviors measured, sleep difficulty, exercise, and frequency of alcohol consumption were all variable as a function of quarantine. Overall, people had more difficulty sleeping and consumed alcohol more frequently during quarantine than they did at the time of participating, but exercised more during quarantine. Although these discrepancies could be due to a myriad of factors beyond the scope of measurement in the current study, differences in these behaviors during quarantine conditions were nonetheless evident.

Additionally, the results from the study reflect a decline in the use of mental health services, as nearly half of those who reported receiving mental health services within the last 12 months were no longer receiving those services. This decrease could have been at least partially responsible for the elevated levels of overall duress illustrated by the responses to other questions about mental health (in that approximately half of the sample reported receiving services). For instance, the average scores from the DASS-21 demonstrated an elevation in students' feelings of stress and depression during COVID-19 quarantine in comparison to previously established normative levels. Even small elevations in mean scores from such a large group of people is unusual, and is typically only found within clinical populations, which suggested significant distress among participants considered as a whole. Simultaneously, however, almost half of the students reported that they were not worried at all or worried very little about the possibility of

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contracting COVID-19. These responses are interesting given the levels of stress and depression reported. The general lack of concern related to COVID-19 infection suggests that the stress and depressive symptoms reported by participants was influenced by something other than fear of contracting COVID-19. The changes to health behaviors referenced earlier, specifically sleep difficulty, could be associated with the heightened stress and depression scores given previous literature that illustrates the effects of stress and depression on sleeping habits (Cramer, Waldorp, van der Maas, & Borsboom, 2010).

Although the vast majority of participants reported awareness of the virus and its methods of transmission, less than half of them expressed average to extreme worry. Given the vast social impact and the astounding rate of increasing cases, more information pertaining to the reason behind people's lack of concern would be useful in future studies and/or efforts to increase adherence to health behaviors.

Responses to questions about housing and financial changes due to the pandemic threat demonstrated that the majority of individuals' housing and financial status were not impacted by COVID-19. The majority of those who reported any kind of disruptive change did so with regard to their housing situation, which potentially alludes to the nature of the sample as primarily college students. This change in housing was thus potentially more predictable and less concerning given the expectation of transitioning away from campus living at some point (independent of pandemic conditions). While less than half of respondent's experienced significant changes to their financial or housing situation, the majority of respondents expressed frustration and difficulty dealing with quarantine and the conditions resulting from COVID-19. This statistic is particularly interesting as it suggests that financial strain and housing changes were not the only factors contributing to a negative perception of COVID-19 (and in fact may

not have even been the primary factors driving these perceptions in this sample). Changes to routine and socialization are among other factors that may have influenced the measurably negative perception of COVID-19 quarantine exhibited by the data collected.

Understanding the long-term consequences of these perceptions, and indeed the implications of extended quarantine and pandemic threat more generally, is important in developing adequate strategies to manage the downstream effects on health, both mental and physical. The decrease in contact and interpersonal interactions has serious implications for mental health and socialization behaviors, for which the majority of people directly affected are likely unprepared. Proper information on the emotional and behavioral response to COVID-19 is necessary to inform future efforts towards reestablishing a sense of normality. For example, understanding the fears associated with everyday or group activities now rendered obsolete by the pandemic is important in assessing the persistence of these responses once life and socialization are back to "normal" (i.e., their pre-pandemic modalities and frequencies of interactions). Thus, it is important to fully comprehend the scope of the virus' effects and leverage that understanding toward helping people adjust to pandemic conditions, which could potentially facilitate greater adherence to preventive public health strategies.

Limitations:

While the present study provided information on many factors that had yet to be accounted for, such as changes to health behaviors and psychological effects of the virus, the sample was composed primarily of undergraduate students. The sample thus presents a limitation as undergraduate students are generally in their early 20's and could reflect individuals who have fewer responsibilities than adults who are employed full-time. Furthermore, undergraduate

students' primary focus is usually academically oriented, which could have influenced the way they read and respond to the survey questions. Thus, it is possible that these conclusions cannot be generalized to the wider population (Brooks et al., 2020).

Given the unprecedented nature of the virus, it took 3 months to design, approve, and implement the study's methods, thus there was a delay between the onset of the pandemic and the survey's distribution. This delay could potentially influence responses as individuals had time to acclimate to the changes associated with quarantine and a nationwide pandemic. Similarly, some of the questions required retrospective recall of behaviors near the beginning of the realization that COVID-19 was going to necessitate lifestyle changes, which could have impacted the accuracy of responses.

Significance for future work

The potential effect of a pandemic threat on psychological responses and health behavior decision-making has serious implications. The patterns of psychological symptoms and rates of failure to follow basic prevention strategies (as recommended by public health officials across the world) reflect the need for more attention to understanding individual psychological factors involved in responding to a pandemic threat. Subjective interpretations of current events are equally as important as objective evaluations given that people's perceptions influence their behavioral responses, such as compliance with healthcare guidelines, avoidance, and stigmatization. In turn, the aggregate of those individual responses determines national and even global rates of disease, death, and potential for virus adaptation to biomedical intervention (as has been evident more recently in variant strains of COVID-19).

Findings from other studies focused on COVID-19 state the role of psychological reactions in "shaping both spread of the disease and the occurrence of emotional distress and social disorder during and after the outbreak" (Cullen, Gulati, & Kelly, 2020). With the recent development of a vaccine, further research should focus on responses to recommendations for vaccination and the impact that the availability of a vaccine has on the psychological and behavioral responses to COVID-19. Moreover, psychological factors are crucial in informing nonadherence to vaccination and hygiene programs along with coping strategies associated with infection or loss (Taylor, 2019). Future research could shed light on whether the availability of a vaccine affects health-behavior compliance, the intensity of psychological reactions, and/or people's evaluation of the pandemic threat. Similarly, understanding more about these factors could facilitate greater insight into methods of shaping public perception and individual decision-making to get vaccinated.

Responses from the survey also hint at the utility and benefit of incorporating technology in public efforts to shape health behaviors and possibly reduce the negative impact of social isolation. Participants perceived technology as a positive influence that helped them feel more connected as 74.5% reported some level of agreement with the statement "technology made me feel connected to my friends/family" (n=204). Based on these results, future efforts might focus on incorporating technology in the search for better ways of providing people with resources to understand and cope with environmental changes, particularly those stressors requiring such significant and rapid lifestyle changes. The increased use of telehealth during the pandemic was possibly one demonstration of the benefit of such advances, as evidenced by the ease with which individuals transitioned to online platforms and people's receptiveness to the changes. In many ways, these advances may influence healthcare service delivery much more broadly, which could

extend care to many people who would not otherwise be able to access it (particularly those in rural areas).

Finally, given the extended period of time individuals spent in quarantine and following health guidelines, future research should look into the long-term behavioral effects of prolonged confinement and limited social contact. Numerous behavioral changes could result from the adjusted lifestyle that resulted from the pandemic, including but not limited to fear of large groups, physical contact, and increased health anxiety. Using insights from surveys such as these (and the WHO's international COSMO efforts more broadly) may begin to build a foundation to understand these issues and develop relevant prevention/intervention strategies.

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