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## Impact of Pandemic Induced Stress on Health Behaviors Related to COVID-19 Susceptibility

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### **Abstract**

The COVID-19 pandemic has encompassed not only a public health crisis due to the range of symptoms and rapid spread associated with the SARS-CoV-2 virus, but it has also resulted in daily life changes due to public health mandates implemented to reduce the spread of the disease. The current study ( $N = 148$ ) tested two hypotheses: that individuals experiencing increased stress due to the pandemic would be more likely to engage in protective behaviors that would limit exposure to the virus (e.g., limiting in-person contact) and that individuals experiencing increased stress would also engage in behaviors that may increase their risk for other health concerns (e.g., increased screen time increasing sedentary lifestyles). Using an online survey design with data collected from a college student sample, correlational analyses found that individuals reporting greater levels of stress were more likely to report reduced in-person contact and to identify COVID-19 as a public health threat. Stress did not relate to adherence to safety guidelines, however, considering COVID-19 as a public health threat did. Stress also correlated with increased screen time and caffeine consumption, but not alcohol or nicotine use. The results of the study highlight the importance of assessing both protective and maladaptive health behaviors when researching the relationship between public health concerns and stress.

*Keywords:* COVID-19, mental health, stress, physical health, public health

## **Impact of Pandemic Induced Stress on Health Behaviors Related to COVID-19 Susceptibility**

SARS-CoV-2 is a virus discovered in late 2019 which resulted in the COVID-19 pandemic due to the virus' cold and flu-like symptoms and quick spread. Many public health mandates (social distancing, mask wearing, etc.) have been implemented to reduce the spread of COVID-19 but like all actions, these changes have brought many consequences, stress being one of them (American Association of Psychology, 2020; Centers for Disease Control and Prevention, 2020). Long-standing research shows the positive correlation between stress and susceptibility to infections due to the indirect relation between stress and immunity (Drummond & Hewson-Bower, 1997; Cohen et al., 1991). This is especially concerning given the worldwide increase in stress and the contagious nature of the virus (American Association of Psychology, 2020; Centers for Disease Control and Prevention, 2020).

### **Impact of COVID-19**

Over the last year, the spread of COVID-19 has caused a lot of changes to occur in the daily lives of people. To analyze such changes and the impact on people's mental and physical health, many studies have been conducted. For example, an interview study was conducted at a large public university in the United States across 195 students to analyze the effects of the pandemic on mental health (Son et al., 2020). Nearly 71% of the sample reported an increase in stress and anxiety after the COVID-19 outbreak. Among those who reported an increase in stress and anxiety, only 10 participants (5% of the sample) sought support from mental health counseling services. In addition to increased stress and anxiety, the majority of the sample reported fear about their health and the health of loved ones (90.1%), and concerns about academic performances (82%). Behaviors were also impacted with the majority of the sample

reporting negative dietary changes (70%) and as well as a decrease in social interaction (86%; Son et al., 2020). This research provides valuable insight into the behavioral, physical, and psychological changes that have occurred as a result of COVID-19 in college students.

Another study conducted using Canadian families found changes in stress levels as related to financial instability, food security concerns, and health-related behaviors (Carroll et al., 2020). Specifically, the study found that concerns about food insecurity and financial instability contributed to an increase in stress for the parents of the households sampled. It is also worth noting that the majority of the sample (across all age groups) reported changes in eating and meal routines along with an increase in screen time and a decrease in physical activity since the pandemic began (Carroll et al., 2020). This research demonstrated that balancing work, homeschooling, food security and financial stability is increasing the stress levels within families.

As indicated in the study conducted by Carroll and colleagues (2020), with social isolation in place, an increase in screen time is likely to occur. A study was conducted to further test the effects of screen time on mental health during COVID-19 (Lee Smith et al., 2020). Individuals reporting more than 6 hours of screen time were more likely to be younger (18-34 years old), current smokers, and reported lower physical activity in comparison to individuals with less than 6 hours of screen time. The study also assessed mental health outcomes with the findings identifying a strong negative correlation between screen time and mental health. Due to the widespread effects of COVID-19, individuals are spending more time on screens. The research conducted by Lee Smith and colleagues (2020) further suggests that this increased exposure can lead to a decline in mental health. Similar research has found that increased

exposure to social media also results in an increase in mental health concerns, including depression and anxiety (Gao et al., 2020).

### **Stress and Immune System Responses**

Overall, research suggests many effects of the pandemic are increasing psychological stress (Son et al., 2020; Carroll et al., 2020) as well as increasing sedentary behaviors that may negatively impact health (Carroll et al., 2020; Lee Smith et al., 2020; Gao et al., 2020). This is especially concerning because increased stress and the prevalence of unhealthy behaviors may leave individuals more susceptible to the virus itself. For example, previous research has shown there is a correlation between psychological stress and susceptibility to the common cold (Cohen et al., 1991).

In addition to past literature associating stress with the common cold, research has also demonstrated that the strong relationship between psychosocial stress and susceptibility to upper respiratory tract infection can begin in childhood (Drummond, & Hewson-Bower, 1997). Specifically, this study found that children with a history of cold and flu were observed to have greater exposure to stressful experiences and emotional disturbances. A low immunoglobulin to albumin ratio was also assessed in these children, depleting their local immune response against infection in the upper respiratory tract and increasing susceptibility to illnesses like cold and flu (Drummond, & Hewson-Bower, 1997).

The spread of COVID-19 has led to social isolation, negative behavioral changes, and an increase in psychological stress due to instability in lifestyle (American Psychological Association, 2020). As observed in past research, exposure to any prolonged stress (e.g., experiencing a global pandemic) reduces the immune system's ability to fight against upper

respiratory infection, potentially increasing physiological susceptibility to COVID-19 (Drummond & Hewson-Bower, 1997; Cohen et al., 1991). However, the current study aimed to examine whether the increased stress due to COVID-19 may result in behaviors that would help to reduce potential exposure to COVID-19 specifically in college students. The Health Belief Model suggests that the likelihood of an individual implementing protective behaviors when facing illness or disease is directly related not only to their perceptions of the effectiveness of those behaviors but also their perceptions of the severity and risks associated with the disease (Champion & Skinner, 2008).

### **The Current Study**

Based off the previous literature spanning work on psychological stress, health related behaviors, and the immune system, the current study hypothesized that students experiencing increased stress as a result of the pandemic would be more likely to engage in protective behaviors that would limit their exposure to the virus. Additionally, the current study examined the relationship between increased stress due to COVID-19 and other health related behaviors. Specifically, it was hypothesized that students experiencing increased stress as a result of the pandemic would be more likely report engaging in behaviors that may increase their risk for other health concerns (e.g., increased screen time increasing sedentary lifestyles).

## **Method**

### **Participants**

The current study was conducted using an online survey which was sent out to all actively enrolled students at a university in Eastern Pennsylvania ( $N = 927$ ). The study was conducted during the first weeks of the Fall 2020 semester. As an incentive to participate in the

survey, students were entered in a lucky draw to win a \$25 Amazon gift card. A total of 148 students responded (46 male, 62 female, 2 nonconforming/other, and 37 did not respond). Of the sample that responded to a demographic question about race and ethnicity ( $N = 111$ ;  $N = 37$  did not respond), the majority of the sample identified as White (59.5%), followed by Hispanic/Latino (15.3%), Asian American (11.7%), Multiracial (6.3%), Other (4.5%), and Black/African American (2.7%). The average age of the sample was 20.13 years old ( $SD = 3.77$ ). This study was conducted as part of a larger scale study, only measures and analyses related to the current research are discussed.

## **Materials**

### ***Perceived Stress Scale***

Stress was measured using the 10-item Perceived Stress Scale (PSS; Cohen et al., 1983). Items such as feeling upset, unable to control important things in life etc. were rated on a scale of 1 (never) to 5 (very often), with higher total scores indicating more stress.

### ***Behavioral Change***

Behavior changes were recorded by having participants respond to a 15-item questionnaire designed to assess how participant behavior has changed as a result of COVID-19. Each item focused on a behavior of interest and was rated on a Likert scale of 1 (strongly disagree) to 10 (strongly agree) with higher scores indicating a greater impact on behavior. Of specific interest to the current study were items regarding changes in alcohol consumption, nicotine use, caffeine consumption, items related to in-person contact, and items related to increased screen time.

For the in-person contact variable, an index was created by averaging participant responses to the two following items: “*The amount of time I spend in person with my family has increased as a result of COVID-19*” and “*The amount of time I spend in person with my friends has increased as a result of COVID-19*”. For the screen time variable, an index was created by averaging participant responses to the three following items: “*The amount of time I spend on social media has increased as a result of COVID-19,*” “*The amount of time I spend gaming has increased as a result of COVID-19,*” and “*The amount of time I spend watching entertainment (movies, TV shows, YouTube content, etc.) has increased as a result of COVID-19.*” The full list of items can be found in Appendix A.

### **Adherence to Safety Guidelines and COVID Threat Assessment**

To assess participant adherence to safety guidelines associated with COVID-19, participants were asked to report which of the following guidelines they followed: wearing a mask, washing hands frequently, maintaining social distancing, and avoiding large gatherings. Participant responses were scored with each behavioral endorsement equaling 1 and then being summed across all items. Finally, participants were asked to rate on a scale of 0 (no threat at all) to 100 (very serious public health threat), how serious of a public health threat they believed COVID-19 to be currently. Descriptive statistics for all measures can be found in Table 1.

## **Results**

Students reporting greater levels of stress were more likely to report reduced in-person contact ( $r = -.24, p = .02$ ) and were also more likely to identify COVID-19 as a public health threat ( $r = .24, p = .008$ ). Reported levels of stress did not relate to adherence to safety guidelines ( $p > .05$ ), however, considering COVID-19 as a public health threat did relate to adherence to



safety guidelines ( $r = .35, p < .001$ ). Students reporting greater levels of stress were also more likely to report increased screen time ( $r = .29, p = .004$ ) and increased caffeine consumption ( $r = .34, p = .002$ ). However, these students were not more likely to report increased alcohol consumption ( $r = .02, p = .91$ ) or increased nicotine use ( $r = .11, p = .42$ ).

### **Discussion**

SARS-CoV-2 spread across the world quickly and resulted in the COVID-19 pandemic, immensely impacting everyone's lives due to the public health mandates (i.e., social distancing, mask wearing) being implemented to reduce the spread of COVID-19. College students comprising a large part of the current and contributing population who are considered to be vulnerable to mental health concerns were observed to be affected by it as well. Long-standing research shows a relationship between stress and immunity. The current study was conducted to investigate the effect of COVID-19 pandemic on the physical and mental health of college students.

Among the various effects of the pandemic that was identified by this survey, some of the prominent findings were students reporting greater levels of stress were more likely to reduce in-person contact, identify COVID-19 as a public threat, have increased screen time, and increased caffeine consumption. However, students experiencing increased stress were not more likely to report increased alcohol consumption or nicotine use. All findings except no increase in alcohol consumption and nicotine use are in line with prior studies (Carroll et al., 2020; Lee Smith et al., 2020; Gao et al., 2020).

Based on prior research about stress and behavioral changes at a large university, results indicated an evident decrease in social interaction which aligns with our findings as our results

indicate reduced in person contact due to increasing levels of stress as a result of the pandemic (Son et al., 2020). Another study by Carroll and colleagues (2020), reported an increase in screen time and decrease in physical activity during social isolation. Lee Smith and colleagues (2020) further suggest that increased screen time exposure can lead to a decline in mental health. Both of these studies supported our findings which indicated students reporting greater levels of stress with also likely to report an increased screen time which is associated with various sedentary behavior and can lead to various health consequences.

The current study also examined the relationship between increased stress due to COVID-19 and other health related behaviors. An unexpected finding of our study that did not align with prior research was that no increase in alcohol consumption and nicotine use was reported. Prior research suggests that increase in stress can lead to increase in alcohol consumption and nicotine use (Centers for Disease Control and Prevention, 2020). There are some possible explanations of this unanticipated result. First, the current sample was conducted on a college campus with a high rate of students transferring to a larger campus for their junior and senior year. Therefore, the current age of the sample was under the legal age for alcohol consumption and nicotine use. As a result, these students may not have established their drinking or nicotine use behaviors at this point in time. Second, data released at the onset of the data demonstrated a large increase in alcohol sales, both in person and online (Nielsen, 2020). This increase may be independent of stress levels. Future research should continue to explore this important relationship between stress and alcohol consumption in the context of the pandemic.

### **Limitations and Future Directions**

There are some limitations within the current study that warrant discussion. The current study was correlational in nature therefore it is unclear if the increase in stress resulted in the

reported behavioral changes or if the reported behavioral changes resulted in the increase in stress. One of the limitations was the method of collecting the sample via a virtual survey due to the social isolation implementations. Due to inequity in access to technology, the current data may not generalize to all college students. Another limitation to this study may be the possible social desirability in participants' responses to showcase strong adherence to the CDC COVID-19 guideline but to maintain a minimal impact of this limitation, participants were made aware of the maintained anonymity the survey collected. Lastly, the demographics of the college sample that was collected was majorly under the age of 21 years which may have impacted our results about consumption of alcohol and nicotine.

The social isolation implementation due to the spread of COVID-19 has led to various negative behavioral changes, and an increase in psychological stress. Past research shows that exposure to any prolonged stress, such as experiencing a global pandemic, reduces the immune system's ability to fight against upper respiratory infections, physiologically increasing the susceptibility to COVID-19. Future research should focus on investigating the long-term physical and mental health-risk effects resulting from stress due to the prolonged nature of COVID-19. Additionally, further research should investigate various coping behaviors and how effective will they be in managing the prolonged stress associated with the pandemic.

## **Conclusion**

Among the sample of 148 college students, important findings from the current study that was supported by prior research was a correlation between stress and unhealthy risk behaviors such as increase in caffeine consumption and screen time indicating a decrease in physical activity. It was also observed that students reporting greater levels of stress were also more likely to identify COVID-19 as a public health threat. Individuals recognizing COVID-19 as a public

health threat were more likely to follow the social distancing guidelines to reduce the spread of COVID-19. It is important to follow the guidelines because long standing research shows a strong correlation between prolonged stress and susceptibility to infection. If the guidelines are not followed, the college student population may be more vulnerable to the susceptibility of COVID-19 due to the prolonged stress negatively impacting the function of their immune systems.

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**Table 1***Descriptive statistics for variables of interest*

Variables	M (SD)	Reported Range	N
Age	20.13 (3.78)	17 - 39	104
Perceived Stress Scale	22.70 (6.76)	8 - 39	98
Alcohol consumption increase	2.02 (1.26)	1 - 5	58
Nicotine consumption increase	2.02 (1.43)	1 - 5	53
Caffeine consumption increase	2.90 (1.48)	1 - 5	84
In-person contact index	2.80 (0.80)	1 - 5	102
Screen time index	3.95 (0.94)	1 - 5	101
Behavioral guidelines adherence	3.74 (0.58)	2 - 4	98
Public health threat rating	65.49 (28.79)	5 - 100	100

## Appendix

### Behavioral Change Survey

The following items are designed to assess how your behavior has changed as a result of the Coronavirus (COVID-19). Rate the following items on a scale of 1 (strongly disagree) to 10 (strongly agree).

1. I spend more time sleeping as a result of COVID-19.
2. I spend more time on schoolwork as a result of COVID-19.
3. I spend more time on physical activities (working out, running, yoga, etc.) as a result of COVID-19.
4. I spend more time on leisure activities and activities I enjoy as a result of COVID-19.
5. My time management skills have decreased as a result of COVID-19
6. My alcohol consumption has increased as a result of COVID-19.
7. My nicotine use has increased as a result of COVID-19.
9. The amount of time I spend on social media has increased as a result of COVID-19.
10. The amount of time I spend gaming has increased as a result of COVID-19.
11. The amount of time I spend watching entertainment (movies, TV shows, YouTube content, etc.) has increased as a result of COVID-19.



12. The amount of time I spend IN PERSON with my family has increased as a result of COVID-19.

13. The amount of time I spend communicating with my family USING TECHNOLOGY (text messages, phone calls, video chats, etc.) has increased as a result of COVID-19.

14. The amount of time I spend IN PERSON with my friends has increased as a result of COVID-19.

15. The amount of time I spend communicating with my friends USING TECHNOLOGY (text messages, phone calls, video chats, etc.) has increased as a result of COVID-19.