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Olivia Talamo

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# CHANGES IN HEALTH BEHAVIORS DURING A GLOBAL PANDEMIC

Olivia Talamo, Undergraduate Student

Dr. Jacquelyn Zera, Department of Exercise Science and Sports Studies

## INTRODUCTION

### *Background*

Coronavirus (COVID-19) is an infectious disease caused by the binding of SARS-CoV-2 to ACE-2 receptors. COVID-19 was first discovered in Wuhan, China in December of 2019 (CDC). By March 11, 2020 the World Health Organization (WHO) declared COVID-19 a worldwide pandemic. A COVID-19 infection can cause severe health consequences, including death. COVID-19 affects individuals of all ages. Individuals who are 60 years of age or older, and individuals with underlying medical conditions are considered vulnerable populations for severe consequences from COVID-19 infection (WHO). COVID-19 primarily spreads through physical contact. Respiratory droplets are produced from the nose and mouth when speaking, coughing, sneezing, and breathing, and therefore can be transmitted through close physical contact. COVID-19 can also be contracted through airborne transmission where small respiratory droplets remain within the air to be inhaled or deposited on mucous membranes. To limit the contraction of COVID-19, physical distancing recommendations have been implemented which led to the closure of non-essential businesses and public service facilities (4). In an effort to contain the virus, many states implemented stay at home orders as well. Alterations to the typical working, social, and domestic environment could possibly result in changes to diet, physical activity, and stress during the COVID-19 pandemic (2, 5, 13).

### *Diet and Exercise*

Previous literature has maintained that nutrition and physical activity are important to overall health and well-being. Nutritional intake for fruits, vegetables, grains, dairy, protein, and oils are dependent upon caloric intake for a particular individual. Although most adults are not meeting nutritional recommendations (7). Due to the COVID-19 pandemic and subsequent stay at home orders, individuals have increased poor nutritional behaviors such as increased snacking, overeating, the consumption of more meals, and consumption of less nutritious foods (1, 12). Physical activity recommendations maintain that individuals should partake in 150 minutes of moderate intensity activity or 75 minutes of vigorous intensity activity per week (8). Across the world, the general consensus is that the COVID-19 pandemic has resulted in a decrease in physical activity, and an increase in sedentary time. It has been noted that these negative effects on activity level may disproportionately affect individuals who were highly active prior to the COVID-19 pandemic (3, 13).

### *Mental Health*

Additionally, previous research has also illustrated that stress can be impacted by diet as well as physical activity, and vice versa (6, 11). During the COVID-19 pandemic, many individuals reported an increase in stress. An increase in stress could result from multiple confounding factors such as financial uncertainty, food insecurity, the inability to remain physically active, and the loss of typical social interactions (9, 10). In one study, it was observed that individuals who were subject to quarantine or isolation experienced double the amount of a poor mental state as opposed to individuals who were not subject to quarantine or isolation. Furthermore, physical activity is a stress relief for many individuals, and restrictions such as the closure of outdoor

parks and nonessential businesses like gyms increased the difficulty of maintaining a typical routine for physical activity (12).

Existing literature has observed suboptimal health behaviors and health outcomes such as diet, exercise, and stress following the COVID-19 pandemic shut downs. However, there is limited research examining the magnitude of observed and perceived change in health behaviors and health outcomes. Therefore, the purpose of this study was to examine the differences in self-reported health behaviors specifically diet, physical activity, and stress before and during a pandemic, as well as the perceived change in health behaviors.

## **METHODS**

### *Participants*

This study examined a sample of eight hundred and sixty-six adults (70.8% female; age= 45±3.4, X % white). Subjects were recruited via recruitment emails, direct solicitation, social media, and word of mouth. Recruitment emails were sent to specific students, faculty, staff, and organizations at John Carroll University through direct solicitation. Social media recruitment was administered via Instagram, Twitter, and Facebook of individuals and groups associated with the researcher. Additionally, individuals who took the survey were encouraged to share the recruitment email or social media post, leading to a snowball effect. One potential limitation of the current study is that the sample population was limited in its recruitment of male and minority participants and therefore the results may not be representative of the general population.

### *Study Timeline*

On March 11, 2020 John Carroll University cancelled courses that were instructed face-to-face and courses were converted to online instruction as a result of the spread of the COVID-19 pandemic. The campus closed all buildings, including dormitories, and all students living in dormitories were sent home. Not long after the closure of campus, Ohio's governor, DeWine, issued a "stay at home" order to limit the spread of COVID-19.

At the time that the stay-at-home orders were implemented, there was minimal to no data regarding changes in health behaviors as a result of the impacts of COVID-19. We attempted to assess the impact of COVID-19 on health behaviors via an 129-item anonymous online survey. The survey was designed to primarily measure physical activity, diet, and mental health prior to the pandemic as well as during the pandemic. Self-reported perceived health changes were also measured using valid and reliable survey questions for each target health behavior (i.e. *the Global Physical Activity Questionnaire (GPAQ)*, *Food Frequency Questionnaire*, and *the National College Health Association (NCHA) Survey*). Demographic information was also collected. The first page of the survey contained an informed consent statement that explained the purpose of the study. Beginning the survey serves as confirmation that the participant had read and voluntarily agreed to participate in the study. All procedures were approved by John Carroll's Institutional Review Board.

Questions were grouped into three categories:

- 1) Pre-pandemic (PRE) health behaviors
- 2) Current (POST) health behaviors

### 3) Perceived change of health behaviors (PC).

PRE and POST included the same set of time frame questions for diet, physical activity, and stress. Additionally, PC questions utilized a likert scale (*increased/improved, no change, decreased/worsened*) for each health behavior. Diet was assessed using Food Frequency questions, where respondents indicated the number of servings of vegetables and fruits were consumed per day as well as takeout/delivery, snack, breakfast, and comfort food consumption. Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ), where respondents indicated the number of times per week they participate in at least ten minutes of vigorous intensity or moderate intensity physical activity as well as strength training exercises of 8-12 reps. Vigorous intensity activity is defined as activity that causes large increases in breathing or heart rate and examples are listed (e.g. running, football). Moderate intensity physical activity is defined as activity that causes a small increase in breathing or heart rate and examples are listed (e.g. brisk walking, cycling, swimming, volleyball). Strength training exercises are defined as and an example is listed (e.g. weight resistance machines). Finally, respondents also indicated levels of stress, anxiety, and depression (e.g. none, less than, average, more than, tremendous) based on questions from the National College Health Association (NCHA) Survey.

#### *Statistical Analysis*

The data was analyzed using SPSS 26.0. A paired sample t-test was conducted to examine differences in self-reported PRE and POST for diet, physical activity, and stress. PC in health behaviors was examined with means, standard deviations, and frequencies.

## RESULTS

The data revealed statistically significant changes in diet ( $p < 0.001$ ), including significant decreases in fruit, vegetable, and water intake, and a significant increase in the consumption of comfort foods. There was a statistically significant decrease in individuals meeting PA recommendations per week ( $p = 0.032$ ) as well as a statistically significant decrease in the number of strength training days ( $p = 0.005$ ). Furthermore, there was a statistically significant increase in stress during the pandemic ( $p < 0.001$ ). Finally, the majority of subjects reported a perceived decrease in PA (41.6%), increase in stress (56.5%), consistent with self-report data. However, the majority of subjects reported no change in dietary habits (38.7%), conflicting with self-report data.

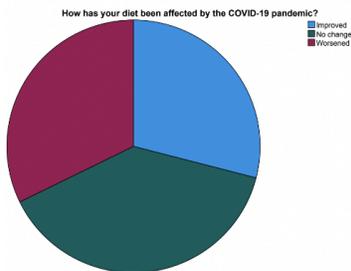


Fig. 1. Perceived change in diet.

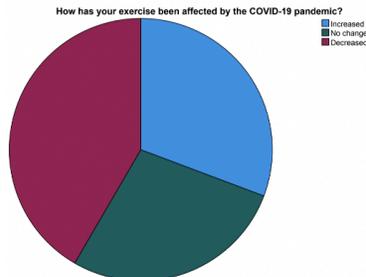


Fig. 2. Perceived change in exercise.

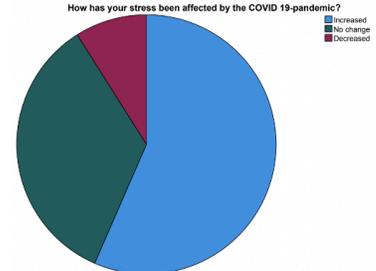


Fig. 3. Perceived change in stress.

## DISCUSSION

This is the first study to our knowledge that attempted to assess changes in health behaviors during the COVID-19 pandemic as well as perceived changes in health behaviors. The primary health behaviors assessed included diet, PA, and stress. Results of the current investigation suggest that the COVID-19 pandemic negatively affects health behaviors. Participants reported dietary changes in which fruit, vegetable, and water intake decreased while the consumption of comfort food increased. In the beginning stages of the pandemic, many grocery stores were limited on their food supply. Additionally, people were advised to limit social contact as well as exposure to other individuals. Thus, trips to the grocery store became less frequent. Furthermore, fresh produce is not as sustainable over long periods of time as canned goods and nonperishable goods. An increase in consumption of canned goods and nonperishable goods could lead to the negative dietary changes as these types of food are typically lacking in nutritional value. Thus, healthier dietary choices such as fruits and vegetables were less frequent as well as less desired due to increased stress levels. Despite the negative impact of COVID-19 on dietary habits, many subjects did not perceive a change in their diet.

Participants also reported a decrease in meeting PA recommendations as well as a decrease in participation in strength training days. One of the consequences of the pandemic was the closure of non-essential businesses and public service facilities. Gyms, recreational facilities, and parks were not considered essential businesses or public service facilities. The closure of gyms, recreational facilities, and parks restricted PA by eliminating facilities and locations for PA. Often, PA serves as a form of stress relief. The limitations on access to facilities for PA could lead to an increase in stress levels. Participants also report an increase in stress. Increases in stress could have been a result of many confounding factors of the pandemic such as job security, new working conditions, routine alterations, limited exposure to stress relief activities, decreased social interactions, and increased time spent at home, to name a few. PA and stress were negatively affected by the pandemic, and most subjects did perceive a change in these health behaviors.

The study effectively describes changes in health behaviors during a global pandemic, yet it is not without some limitations. The study population included subjects who lived in different states. COVID-19 guidelines and protocols were implemented according to the governor and the state government. Therefore, the differences in residence locations could result in different experiences as different guidelines and protocols could have been implemented. Furthermore, the population of the study was confined primarily to the states within the Midwest. Additionally, all the collected data relied upon self-reported behaviors. This requires honest and accurate descriptions of previous and current health behaviors. Future research should investigate the impact of perceived changes in health behaviors during a pandemic on the subjects. Future research should also investigate social and demographic factors that influence changes in health behaviors in addition to the perception of negative changes in health behaviors to better identify as well as support vulnerable populations during a pandemic. It would also be interesting to investigate if the changes in health behaviors were only temporarily altered during the pandemic, or if the changes to health behaviors resulted in the formation of new habits. This data is preliminary, but it is important to note that the identification of changes in health behaviors is required in order for health behaviors to be altered.

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