Increase in Stress and Post-Traumatic Stress During Six Month Quarantine in Various Demographics

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ABSTRACT

Due to the Coronavirus, people have been quarantined for periods of at least six months all over the world. In the United States, there have been over six hundred thousand Coronavirus deaths and over 33 million cases of COVID-19 as of May 2021(World O Meter 2021). When the pandemic first struck, 23 million people in the U. S. lost their jobs. Today's unemployment rate is higher than it was during the Great Depression, which lasted from the 1920s to the late 1930s. People are stressed about COVID, according to John Hopkins (Maguire 2020), and they encourage people to find coping mechanisms. When a person is stressed, they experience physical or emotional tension (MedlinePlus 2020). Since coping can have a detrimental effect on the immune system, coping in necessary (Maguire 2020). This study sought to determine whether people aged 18 and up experienced a rise in stress levels during a 6-month quarantine period. Then, based on the Impact of Event Scale - Revised (IES-R) score, this study would determine which coping mechanism, if any, is most successful in alleviating quarantine-induced stress. It was found that there was a significant increase in stress levels after a six-month quarantine period with a confidence level of 95% and a p-value of 0.00000031. The data also showed that there was not a significant difference in the stress levels between varying coping mechanisms with a p-value of 0.23. It is recommended to use a coping mechanism; all coping mechanisms are effective when matched properly to each individual.

Introduction

Stress is when a person feels physical or emotional tension (MedlinePlus 2020). Stress can affect a person's physical and mental wellbeing, for example, chronic stress can result in heart issues, increased blood pressure, and increased stress hormones (A.P.A. 2020). Mental effects of stress can include experiencing anxiety, depression, and feeling anger, sadness, fear, and frustration (Mental Health Foundation 2020). The main factors that can trigger a stress reaction are increased personal pressure, increased social and financial changes, overwork, environmental or home situation, increased responsibilities, increased uncertainty, and boredom (Mind 2017).

People worldwide have been quarantined for periods as long as six months due to the Coronavirus pandemic. There have been approximately six hundred thousand deaths due to Coronavirus and more than 30 million cases of COVID-19 in the United States as of May 2021 (World O Meter 2021). After the pandemic first hit the United States, 23 million people were unemployed. The unemployment rate in April 2020 was higher than that during the Great Depression from the 1920s to the late 1930s. Even so, the unemployment rate has decreased after six months since the pandemic began. The current unemployment statistic is lower at 12 million people, which is still elevated compared to 2019's employment levels (Koeze 2020). Before the coronavirus pandemic, there were 7.4 million people unemployed. Job loss is considered one of the most stressful experiences in life. Stress from unemployment can cause depression, anxiety, and fear (Help Guide 2020). "The stressor factors suggested included longer quarantine duration, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma. Also, during an outbreak, people are fearful of falling sick or dying themselves" (Mattoli et al. 2020).

Studies show that being in quarantine for an extended period is stressful for a lot of people. Johns Hopkins (Maguire 2020) acknowledges that people experience stress about COVID and they urge people to find ways to cope. Coping is essential because without it, among other consequences, periods of stress are prolonged and can negatively affect the immune system (Maguire 2020).

Since the beginning of the pandemic, the world has shifted online to function through quarantine and physical isolation. Many people, such as teachers, are finding this transition very stressful. Scientists have tied this increase of stress to negative implications on the voice (Besser 2020). Furthermore, many students who have to share devices, have a bustling family at home and take care of family members also experience stress due to the shift to online learning (Field 2020). This study will see whether there is a significant increase of stress over a six-month quarantine period among people 18 and older who reside in the United States. This study will also seek to determine which coping mechanisms are the most effective in dealing with stress.

Material and Methods

The PSS test was created by Dr. Cohen in 1983 (Cohen and Janicki-Deverts 2012). During his experiment, he used the P.S.S. test to determine the overall stress rates of different demographics among adults residing in the U.S. population. For the P.S.S. test, a higher score signifies more stress. A score of 0-13 indicates low stress. A score of 14-26 indicates moderate stress. A score of 27-40 would be considered high stress. This experiment mirrored Dr. Cohen's controls. Other metrics were also collected and analyzed to determine whether there are any patterns that were not previously considered, such as a possible trend between race and coping mechanism preference. The survey also included a consent form to formally document participants' permission to use their personal information for research purposes (Figure 5). The Impact of Event Scale - Revised, IES-R, is used to measure post-traumatic stress based on a certain event that can be marked as traumatizing. A high total score on the IES-R of 37 and over means that the event can be debilitating on your overall performance and may suppress your immune system's functioning. A score of 33 and above signifies a probable diagnosis of PTSD. A score of 24 or more means that PTSD is a concern, and participants may demonstrate symptoms of PTSD (Impact of Event Scale-Revised 2021).

The first part of the study administered the P.S.S. test to participants to measure whether stress levels have increased after one year of quarantine. The data collected in this experiment was compared to P.S.S. scores gathered one year ago during the beginning of quarantine. The survey also included the IES-R test to see whether people viewed quarantine as a traumatic stress-inducing event. The dependent variable in this experiment was the different stress levels received from the P.S.S. test (Figures 1&2). The alternative hypothesis for this experiment was: There is an increase in the stress levels of people aged 18+ during a six-month quarantine period. The survey had three sections. The first section asked the participants for information about race, age, times thought about the Coronavirus and income. The ranges in an age that participants selected from are 18-24, 25-34, 35-44, 45-54, 55-64, and 64 and over. The participants' races are African American, Asian, Hispanic/Latino, Caucasian/European Descent, American Indian/Alaska Native, and Native Hawaiian or Other Pacific Islander. There also was an "other" option so the participants can more accurately identify themselves. Participants were able to choose more than one box as this will account for a multi-racial participant (Figure 3). The number of times participants thought about Coronavirus daily were divided into the following ranges: 0 to 2 times, 3 to 6, 6 to 9, 10 or more times. The second section was the P.S.S. test (Figure 4). The third section was the IES-R test. The participants were asked if they reside in the United States of America. If the participant lived in the United States, their data was included in this study. This survey was anonymous to protect the identities of the participants. The data from the P.S.S. tests were analyzed using either the independent t-test or the Mann-Whitney/ Wilcoxon Rank Sum test.

The second part of the study used the IES-R test to measure which coping mechanism is the most effective when facing a stressful situation, such as the COVID-19 quarantine. The survey asked participants to mark whether they practice any of the following activities, which are considered by Psych Central (2020) to be adequate mechanisms to cope with stress: deep breathing exercises, deep muscle relaxation, meditation, yoga, listening to music, making

art, making to-do lists, stopping unhealthy practices (drinking and smoking), avoiding caffeine, getting 7-9 hours of sleep a night, and talking about your feelings to a person you trust (Figure 3). Along with these coping mechanisms, the survey also included an "other" option for the participant to enter any coping mechanism that was not listed. The data collected from this portion of the study helped determine which coping mechanism, if any, is the most effective in relieving quarantine-induced stress based on the IES-R score. The survey also asked participants to rate the efficacy of their chosen coping mechanism(s). Once the data was collected, it was analyzed using the one-way ANOVA on Excel. The mean score of the categories from the IES-R test showed whether the six-month quarantine period due to the Coronavirus could be classified as a stressful life event. IES-R was also used to determine which racial group, income range, and ages have received a bigger stress impact from the six-month quarantine period (Figure 3). The Pearson's correlation test was administered to find if there was a correlation between P.S.S. and IES-R scores. The Chi-square test was also used to determine if race was a determining factor in the number of times people thought about Coronavirus.

Since the initial experiment, the coronavirus quarantine has continued in the U.S. for one year. The experiment compared the P.S.S. results of that experiment to the newly acquired P.S.S. data in this research study. This experiment tested 300 more people and compared the increase, decrease, or constant rate of participants' average P.S.S. scores. The survey was sent out to the same demographics as the previous survey to reduce variation. In the first portion of this study, a small sample of Asian people, Native Islanders, and Native Americans took the survey. To increase the amount of Asian, Native Islanders, and Native Americans participation in this part, the survey was distributed to organizations focused on those demographics, such as specific racial affinity Reddit pages. Stratified sampling methods were employed to reduce the inevitable variance that arises from different sampling individuals. As a stratified sampling method aims to be predictive of this population, any random stratified sample taken from this group should yield similar results. Furthermore, since the survey had been set up in all instances to be anonymous to protect the identities of participants, this method provided the most accurate and unbiased results.

Results

For the first hypothesis of this experiment, an independent t-test was used to help determine whether there has been a significant difference between the stress levels at the start of the COVID pandemic and after six months of quarantine. The test revealed that there was a significant difference with a p-value of 0.0000003. At the start of quarantine, the average P.S.S. score of people 18 and older residing in the U.S. was lower at 19.7, while the mean P.S.S. score of people 18 and older living in the U.S. after 6 months of quarantine was higher at 22.6 (Figure 6). The second hypothesis of the study was analyzed using the One-way ANOVA test. The test revealed that there was not a significant difference between the different coping mechanisms and post-traumatic stress with a p-value of 0.23 (Figure 7). Another p-value demonstrated the correlation between the P.S.S. and IES-R score. Using Pearson's Correlation Coefficient, it was determined that there was a significant correlation between the IES-R and P.S.S. scores with a p-value almost equivalent to zero and a Pearson's R-value of 0.58 (Figure 8).

The descriptive statistics and a p-value revealed a significant difference in the IES-R scores between the different races. The average PSS scores from lowest to highest are the African Americans, Asians, Caucasian/Europeans, Mixed Sample, and the Hispanic groups. African American/Black people surveyed had an average score of 16.03. Asian people who took the survey had an overall IES-R score of 29. People of Caucasian/European Descent had an average IES-R score of 31.84. The mixed sample, a sample with multiple races that were too small to be represented as one category, has a mean IES-R score of 33.7 (Figure 9). The Hispanic and Latino group had an average score of 34.08 (Table 2). When the scores of each race were analyzed using the One-way ANOVA, it was found that there was a significant difference in IES-R scores between racial groups with a p-value of 7.6E-10. Similarly, a similar result was found when analyzing the P.S.S. scores of racial groups. The African American/Black group had an average of 21.45. The Caucasian/European Descent had an average mean of 23.16. The Asian group had a P.S.S. score of 21.60. The Hispanic/Latino group had an average score of 23.56. 24.75 was the average P.S.S. score of the mixed

sample group. When the data for the racial groups and P.S.S. scores were analyzed using the One-way ANOVA test, it was found that there was a significant difference between the groups with a p-value of 0.0067 (Figure 10 and Table 2).

The data also revealed a significant difference between groups of people who think about COVID-19 more frequently than less frequently in both IES-R and P.S.S. scores with p-values of 0.00071and 7.40E-05, respectively (Figures 11&12). The descriptive statistics also offered information that supported the p-values. People who thought about COVID from 0-2 times a day had an average P.S.S. score of 21.08 and an IES-R mean of 23.46. People who thought about COVID-19 3 to 6 times had a IES-R score of 27.71 and a P.S.S. average of 27.71. The average IES-R score was 32.48, and the average P.S.S. score was 24 for people who thought about COVID-19 6 to 9 times a day. People who thought about COVID-19 more than ten times a day had an average P.S.S. and IES-R scores of 24.65 and 35.31 (Figures 11&12).

There was also a significant difference between the IES-R scores of people with an annual income of less than $30,000 and over $91,000 (Figure 13 and Table 1). The independent t-test was used to determine the p-value. A p-value of 0.04 verified the significant difference between the people of the two different income levels. The average of people who made less than 30,000 dollars was 29.15, while people who earned greater than 91,000 dollars had an average P.S.S. score of 23.33.

There was not a significant difference in IES-R score among people of different age groups (p=0.12) (Figure 14). People aged 18-24 had an average IES-R score of 30.68. 25.17 was the average IES-R score for people aged 25-34. People aged from 35-44 had a mean IES-R score of 25.74. People aged 45-54 had an average IES-R score of 26.90, while the average IES-R score of people aged from 55-64 is 24.07. The IES-R score of people older than 64 was 21.36 (Table 3).

It was also found that there was no significant difference (p=0.314) in how people perceive the effectiveness of their coping mechanism and their stress scores. The average P.S.S. score for people who do not perceive their coping mechanism to be effective was 19.8 while the average score for people who thought that their coping mechanism was helpful to a great extent was 22.02. 22.75 was the average score for people who thought that their coping mechanism was helpful to a moderate extent. The people who perceived their stress levels as helpful to a small extent had an average P.S.S. score of 22.71. The people who perceived their stress levels as helpful to a very great extent had an average P.S.S. score of 21.28. 23.33 was the average P.S.S. score for people who thought that their coping mechanism was helpful to some extent (Figure 15).

Discussion

A strong correlation between P.S.S. and IES-R scores (p ~0) was expected because increased stress is one of the leading factors that lead to post-traumatic stress disorder (P.T.S.D.) (Maeng and Mohammed 2017). The data show that there has been a significant increase in stress levels after six months of quarantine due to the coronavirus pandemic with a p-value of 0.0000003 (Figure 6). The increase in stress levels is likely due to the increased death rate and isolation due to quarantine (Karlovitch 2020). The death toll in the U.S.A. due to COVID as of May 2021 is 600,535 with more than 33,747,638 total cases of COVID-19 in the United States of America.

Furthermore, isolation can disrupt a human's nature to be social by nature and cause emotional stress. Isolation is considered a major stress factor and a potential risk for mortality (Cruces et al. 2014). Stress has also been tied to the fear of getting COVID-19. Scientists suggest reducing the amount of stress, that citizens wear a mask, follow social distancing, and other safety protocols (Goodman 2020). The data suggested no significant difference in stress levels between people who practice different coping mechanisms. This is possible because coping mechanisms can either have a positive or negative effect on an individual and regardless of the method, the coping mechanisms the participants listed all seem to have the same positive effect on their emotional state (Lumen 2021). Also, almost all the participants selected more than one coping mechanism. It is possible a combination of these mechanisms affected their stress levels (Figure 7).

It was found that there was a tremendous significant difference in the stress levels of people who make more than $91,000 a year than those who make less than $30,000 a year. With an Independent t-test, the p-value measuring the change in stress in people making more than $91,000 a year from 2020 to 2021 was 0.0078. The p-value measuring the change in stress levels of people who made less than $30,000from 2020 to 2021 was 0.015. Both values are statistically significant and prove the change in stress levels between both groups. One of the more surprising results is that the 2020 increase in stress was more statistically significant than the 2021 increase in stress. This result was found using the Whitney-Mann U test due to the unequal variances of the different groups being tested. The Z critical value being compared to the Z value was 1.65. The Z-score for the 2021 increase was 2.17, while the 2020 increase was 5.019. This difference is believed to be attributed to the initial shock of Coronavirus, mass unemployment, and shortages. These three results highly affected poverty, rather than people with a high income. This can account for the significant difference between people with a high income and a low income in 2020. As time continued, stores became fully stocked, and the employment rates have increased since 2020. In 2021 the employment level increased from 2020, and quarantine life normalized. These factors may decrease the gap between the pandemic-related stress levels of people of low and high incomes.

Descriptive statistics also demonstrated increases in stress levels across several categories. There was an increase in the stress levels between the White, Hispanic, and Black racial groups (Figure 16). There was also an increase in stress levels between people who thought about COVID-19 different times a day (Figure 17). All the different income ranges experienced an increase in stress, besides the people who make less than $30,000 dollars a year (Figure 18). Some major issues that affected people with a lower income when the pandemic first started were surrounding major job loss and food shortages. As the pandemic continues, job loss is stabilizing and there are no threats of a food shortage. While these conditions do not eliminate stress during the pandemic, they might be sources of alleviation for people who were heavily affected by it previously. Most of the age averages experience an increase in stress (Figure 19). The reason why not all of the age groups may have increased due to small sample sizes. For the 64 and over age group the sample size was 8 in 2020 and 11 in 2021, these small sample sizes are not representative of the 64 and older population in the United States. The decrease in stress for the 64 and older age groups may also be contributing to the spread of the vaccine during the survey period among senior citizens. These increases in almost all categories demonstrate the impact of COVID-19 on most people's stress levels and mental states. This data aligns with the hypothesis that there was an overall significant increase in stress between 2020 and 2021.

The p-values suggest that there was a significant difference in the stress levels between participants of a different race (Figures 9 & 10). This conclusion is mirrored in how COVID has been disproportionately affecting low-income communities of color (Aubrey 2020). As of March 2, 2021, the leading race to be affected by Coronavirus is Black people, then Pacific Islanders, then White people, then Latino people, then Asian people (A.M.P. 2021). These numbers are not reflected in the demographics of the participants surveyed. The reason that the Black people surveyed in this study have the lowest P.S.S. and IES-R scores may be because most of the participants are affluent and make over $91,000 a year. With a p-value of 0.04, it has been found that there is a significant difference in the IES-R scores between people who make more than $91,000 annually and people who make less than $30,000 a year using an Independent t-test (Figure 13). The statistical difference may be due to stress surrounding job loss. In the last six months, 13 million people have been unemployed, and 26 million people apply for unemployment aid (Miranda 2020). There is a lot of stress accumulated from job loss due to its effects, such as not paying rent or supporting a family (Parker et al. 2020).

The Asian demographic also may have had the lowest P.S.S. average because they have a high percentage of people in the 18-24 range, which would also help explain why most Asian participants make less than 30,000 dollars a year. July of 2020 had the highest unemployment rate between people from 16-24 since 1948 (U.S.U.S. Bureau of Statistics 2020). In this study, people who worked 18-24 had the most people think about Coronavirus from 0-6 times a day while the other age demographics thought about COVID-19 more than ten times a day. A p-value of 7.40×10^{-5} shows a statistically significant difference between IES-R scores of people who think about COVID at different times a day using the One-way ANOVA test. According to Yu et al. (2020), rumination has impacted college students' stress

levels and mental state during the COVID-19 pandemic. They predict that the levels of rumination's adverse effects were not balanced with the coping mechanisms the college students selected (Figures 11&12). People who thought about COVID-19 more daily also experienced higher post-traumatic stress due to the pandemic. These results might be linked to news exposure and stressful events resulting from the COVID-19 pandemic (Tucker and Czapla 2021).

There was no statistically significant difference likely because of the high levels of people who used the exact coping mechanisms (Figure 14). In every age group, the most utilized coping mechanism was listening to music. The frequencies of the coping mechanisms in each age group were very similar and may contribute to the equally distributed effect in stress relief among the participants. Krisinta Fuller finds that personalized coping mechanisms are very helpful in preventing stress. The results that were received indicates that the participants all chose coping mechanisms that properly catered to their needs when managing post traumatic stress. There was also no significant difference in how each participant perceived the effectiveness of their coping mechanisms and their P.S.S. scores (Figure 15). Health Assured (2019), a top-rated wellbeing provider, speculates that perceived stress is based on a participant's feelings and, therefore, less reliable and concrete than actual stress levels, which can be measured off responses to certain situations. By asking participants to rate their coping mechanism's effect on their stress levels, the participants were asked to self-evaluate their stress based on their emotions. Their perception is inherently different from their actual stress, which is indicated by the evidence-based P.S.S. and IES-R tests. The results, which support the null hypothesis, show that there is no significant difference between the perception of effectiveness and stress levels, suggesting that participants' stress prediction is different from their stress levels as based on the P.S.S. and IES-R tests. This finding suggests that people are having trouble identifying how effective their coping mechanisms are, this may lead to uncertainty about whether they should or shouldn't continue working with that specific coping mechanism. There is no correlation between a coping mechanism's perceived effectiveness and PSS scores with a p-value of 0.75. With a p-value of 0.54 it was found that there is no correlation between IES-R and Perceived Efficacy. These results show that the participants were not able to gauge the effectiveness of a coping mechanism.

This research would be influential in identifying practices and situations that can ease stress. Since this research identifies an increase in stress for almost every demographic, it highlights the importance of finding coping mechanisms to decrease stress. To find a coping mechanism that works best, a person should try different mechanisms to see which one is more effective. Since all the coping mechanisms are effective, the one that fits a person's lifestyle best, meaning that they are able to use this coping mechanism routinely, should produce the best results. An app using X-code software to create an app can be used to create a system that would help people track their stress functions by taking a weekly P.S.S test, IES-R Test, and Social Readjustment Rating Scale (SRRS) Test. It would also use data from the past 2 years surrounding stress scores to help develop and recommend the best fitting coping strategies for a person based on a series of questionnaires. These monthly surveys would track the stress levels of each individual and check other variables such as their post-traumatic stress and stress-based life events. With this system, participants would be able to effectively both track the effectiveness of specific coping mechanisms and based on this user submitted data, eventually find the coping mechanism that works best for them. The system would work when the participant takes a stress test, and then their scores get compared to the database. The backend then calculates their stress scores which will impact the overall user experience a participant has. The participant will also be able to fill out a user profile that will be sent to the database to retrieve their data. There will also be "bicycling," which displays the pattern of their stress levels over months, displaying data that has been collected and stored in the database (Figure 20).

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