Adolescent Fear Anxiety and Knowledge of COVID-19

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Abstract

On December 31, 2019, a previously unknown pneumonia was detected for the first time in Wuhan, China. This virus, later named COVID-19, would then completely change the world as we knew it. The relationship between knowledge and fear is one that has been contested with two prevalent schools of thought; is ignorance bliss, or is knowledge security. This project surveyed 109 people and utilized a Google Form. The form consisted of three parts, the first of which being a background question asking about location and age, the second part was a short seven question background knowledge questionnaire about the virus, and the third part was ranking questions for fear, anxiety, and impact. For this data set, the chi-squared test for association and the Spearman rank correlation coefficient were utilized to assess the data for statistically significant connections as levels of impact, anxiety and fear are ordinal data. There were highly statistically significant associations between: fear and anxiety; anxiety and accuracy; and fear and accuracy, and highly statistically significant negative correlations between: anxiety and accuracy; and fear and accuracy. This project suggests that knowledge is linked to lower anxiety and fear levels, contrary to the popular belief that ignorance is bliss.

Keywords
Covid-19, Knowledge, Anxiety, Fear, Statistics.

1. Introduction and Research
The purpose of this project is to study the relationship between fear, anxiety, and knowledge during the COVID-19 pandemic. Fear is here defined as an emotion caused by anticipation or awareness of danger. Anxiety is defined as a feeling of worry, nervousness, or unease, typically about an imminent event or something with an uncertain outcome. The separation of these two factors was inspired by research that suggested that fear inhibits pain whereas anxiety enhances it (Rhudy *et al.* 2000). This is important as this means personal anxieties about COVID-19 would grow over time whereas fear about the virus would decrease over time.

The relationship between anxiety, knowledge, and fear related to COVID-19 has been examined in a meta study of the Indian Population (Roy *et al.* 2020) concluding that COVID-19 was a stressor but also lacked a complete understanding of the virus and common symptoms. This study was then extended to the general global population, saying that those results represented the typical views of a person. Additionally, COVID-19 was shown to be a major source of anxiety for college students (Cao *et al.*2020). This study was also extended to all college students, saying that most college students found COVID-19 to be a major source of anxiety and uncertainty.

The associated changes of lockdown also were shown to be a major stressor (Brooks *et al.* 2020). Research into the relationship between perception and accuracy related to the Ebola virus also inspired this research as that research suggested a lack of understanding about the virus (Abebe *et al.* 2016). Similarly, there was a study conducted in Trinidad and Tobago concerning knowledge of H1N1 that concluded that there was a general understanding of the virus but a misunderstanding of its spread (Johnson *et al.* 2017). These studies show that during a pandemic there is a lack of understanding about the virus, stress from the changes in life, and a misperception of risk.

All of these papers, when read together, show a general trend of fear and anxiety during times of pandemics. These papers inspire further research to examine a high school demographic as this cohort is frequently excluded from the analysis. Because the high school demographic is less researched about their emotional response to pandemics, the goal of this study is to see if the pattern of higher fear and anxiety with low knowledge is the same for that cohort. The concept of this paper is to use statistical analysis to analyze the relationships between emotions and actual understanding.

2. Methods

It is suspected that lower anxiety and fear would be associated with lower accuracy for the COVID-19 knowledge specific questions because not knowing how dangerous coronavirus is might cause them to stress less about it. It is also suspected that people are more anxious about the virus rather than afraid of the virus as they could be more stressed and this survey was taken approximately one month into quarantine and the initial shock level may have faded. The null hypothesis is that there is no association and/or correlation between anxiety and fear while the alternative hypothesis is that there is an association and a correlation between anxiety and fear.

2.1 Survey Information

This data was taken from Google Forms (https://docs.google.com/forms) and had 7 multiple choice questions about the virus and linear rank questions for fear, anxiety, and impact. The knowledge section was graded via multiple choice questions with various possible answers with an option to type their own answer. The surveyor then manually graded the free choice answers by comparing to the other answers and correct question answers to grade it.

2.2 Knowledge Questions

The specific questions were seven multiple choice questions on a range of topics related to the virus such as spread, key terminology, and cause of death. The questions were selected based on a few criteria. First, topic importance to general understanding of the virus. Second, relevance to the general population. Third, simplest form of testing knowledge in said subject. The answers questions were written to be as clear and simple as possible while also not revealing the answer in the question. The answer choices were selected to cover a wide range of beliefs about the virus.

1. Why is it important to self-isolate?
   a) It helps reduce the spread of the virus by keeping sick people at home (correct answer)
   b) It helps reduce the spread of the virus by keeping everyone at home and not interacting (correct answer)
   c) It's not, it's unnecessary
   d) I'm not sure
   e) Free response other

2. What does flattening the curve mean?
   a) Eliminating the virus completely
   b) Reducing the number of cases to one that can be managed by the medical system (correct answer)
   c) I'm not sure
   d) Free response other

3. Why are ventilators important?
   a) They help to treat COVID-19 positive patients who can't breathe (correct answer)
   b) They help reduce the spread of the virus to other people
   c) They aren't
   d) I'm not sure
   e) Free response other

4. What is the cause of death for COVID-19 patients?
   a) Lung related complications (correct answer)
   b) The virus itself and its symptoms
   c) I'm not sure
   d) Free response other

5. Why are masks and personal protection equipment important?
   a) They reduce the spread of the virus by air (correct answer)
   b) They protect people from asymptomatic carriers of the virus (correct answer)
   c) They aren't
   d) I'm not sure
   e) Free response other

6. What does social distancing do and why is it important?
   a) It helps reduce the spread of the virus by keeping those sick and asymptomatically sick at home (correct answer)
   b) It's only helpful if you are actually sick and it then reduces the spread of the virus by keeping sick people away from the general public
   c) It doesn't, it's unnecessary
   d) I'm not sure
   e) Free response other

7. How can the virus spread?
   a) Mostly by physical contact with infected surfaces
   b) Mostly by coming in contact with respiratory droplets that contain the virus (correct answer)
   c) I'm not sure
   d) Free response other

2.3 Anxiety and Fear Questions
The specific questions related to anxiety and fear were as follows:
1. How anxious are you about the coronavirus?
2. How afraid of the coronavirus are you?

These questions were ranked on a scale of 1 to 5 and had a further question to explain or elaborate if a 4 or 5 was ranked for any points.

2.4 Additional Questions
In addition to the knowledge quiz and fear and anxiety self assessment, a few background questions were asked as well as questions for the survey taker to explain their answers if they so desired. All of these questions were optional.

1. How old are you?
   a. Under 12
   b. 13-15
   c. 16-19
   d. Adult
2. Where are you from?
3. Anything else about your background that would impact your virus related anxiety?
4. If you have answered a 4 or 5 for any of those answers please explain why
5. Any questions or comments?

These questions allowed the participant to provide further background information which could be used in a later study to examine geographical factors and fear or background and fear.

3. Data and Statistical Analysis
Data were collected via a Google form sent out to Stanford Online High School students, students from Rumson, NJ and students in Westwood, MA. It was graded on a scale of 0 to 7 for knowledge accuracy. The fear, anxiety, and impact questions were not graded. For those values, it was the value selected by the survey taker. These data were collected over a two week period and received 109 responses.

For statistical analysis, the chi-squared test for association and the Spearman rank correlation coefficient (SRCC) were utilized. These tests were relevant as they compare data sets and can compare ordinal data. The chi-squared test for association allows one to test for the presence of a relationship and the SRCC can show the strength of that relationship and the direction of that relationship.

3.1 Data Presentation
These figures were created in JMP (https://www.jmp.com/) and include a histogram, a box and whisker plot, quantiles, and summary statistic information.
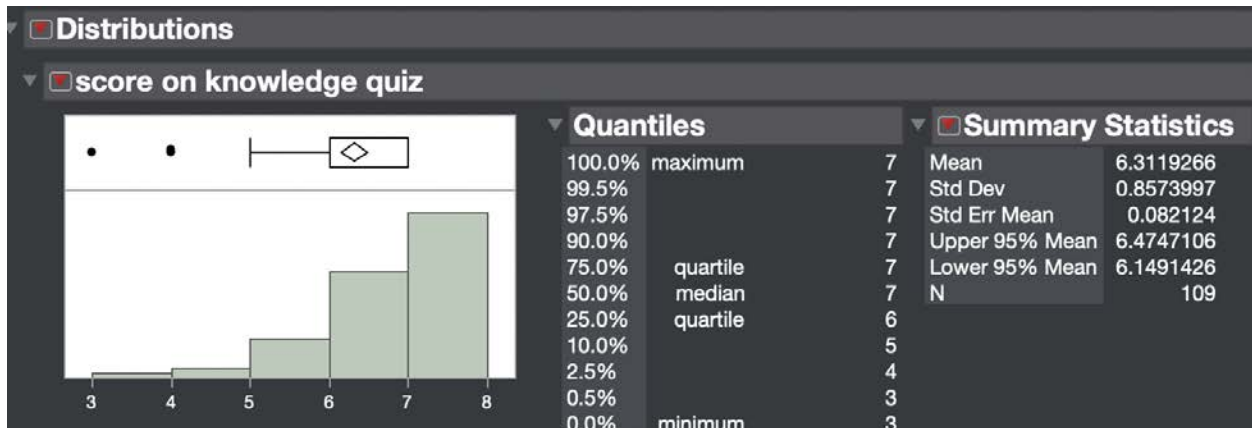
Figure 1. Knowledge Score Distribution and Summary Statistics

The knowledge scores range from 3 to 7 and no one got below a 3 (Figure 1). This distribution suggests that most participants knew basic information about the virus. Anxiety scores ranged from 1 to 5 and were roughly normally distributed which is shown in Figure 2. Participants were mildly anxious about the virus.
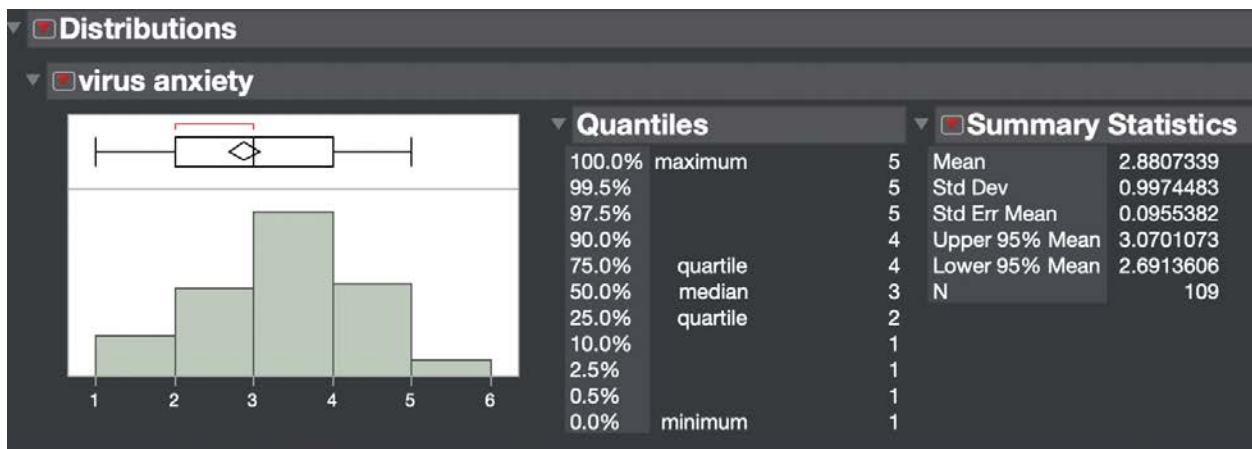
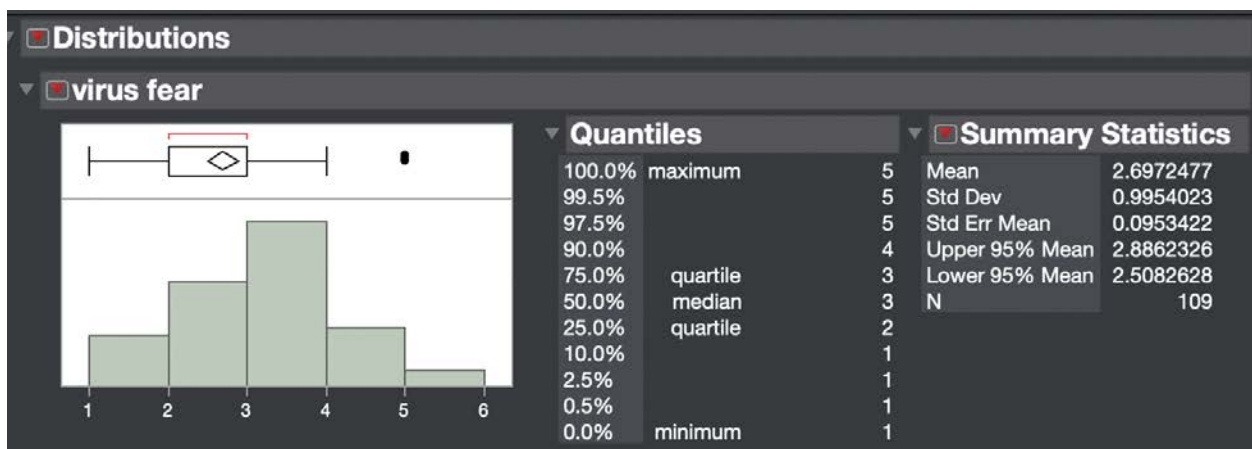Figure 2. Anxiety Distribution and Summary Statistics

Figure 3. Fear Distribution and Summary Statistics

Fear scores ranged from 1 to 5 and were also roughly normally distributed (Figure 3). This means that most subjects were mildly afraid of the virus.

3.2 Chi-Squared Test for Association

The chi-squared value for fear and anxiety was 98.79 and had 16 degrees of freedom. The critical value for a 1% significance level was 32 which makes this result highly statistically significant. The chi-squared value for fear and accuracy was 45.71 and had 12 degrees of freedom. The critical value for alpha = 0.01was 26.22 which also makes this result highly statistically significant. The chi-squared value for anxiety and accuracy was 46.43 and had 12 degrees of freedom. This chi-squared value is greater than the critical value of 26.22 which makes this result highly statistically significant (p-value<0.01). Thus, fear and anxiety, fear and knowledge accuracy, and anxiety and accuracy have a statistically significant association.

3.3 Spearman Rank Correlation Coefficient

The correlation coefficient for fear and accuracy was -0.5116 with 107 degrees of freedom, which gives a p value of <.000001 which is highly statistically significant. The r value for anxiety and accuracy was-0.6613 with 107 degrees of freedom and a p value of <.000001 which is also highly statistically significant. This indicates that there is a statistically significant correlation between knowledge and anxiety and knowledge and fear and the r value indicates that said correlation is negative (Figures 4 and 5).
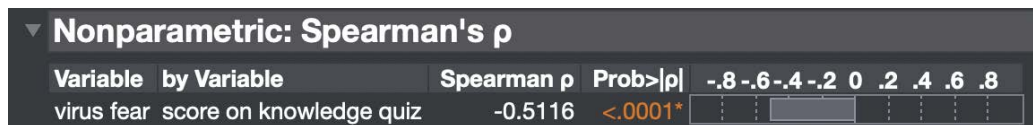

Figure 4. SRCC Anxiety and Accuracy

Figure 4. SRCC Fear and Accuracy

4. Conclusion

This research suggests that as personal anxiety and fear increases, the knowledge decreases. These data suggest that knowledge is linked to lower anxiety and fear levels which is contrary to the popular belief that ignorance is bliss. This is contrary to the expected result of higher anxiety and fear with higher accuracy. The expected result was that anxiety, fear, and accuracy would all be positively correlated because not knowing the risks can put one at ease. However, contrary to expectations, higher knowledge is linked to lower anxiety and lower fear levels. This may because knowing the risks allows one to make more reasonable decisions.

5. Future Opportunities

There are some limitations to this research as well because the demographic was only people from 12-19 which only accounts for adolescents. To extend this research, it would be interesting to get a larger survey population and a more controlled time window. Additionally, information related to the virus is constantly changing, so taking it at a different time with more accurate or in-depth questions would also be a further application. Another extension would be to get more specific demographic information, news sources, and learn about what prevention methods they utilized and compare that to their fear, anxiety, and accuracy.

6. Acknowledgements

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Biography

Sophia Risin is a high school student at Stanford Online High School. She is a national certificate of distinction winner from the National Center for Women and Information Technology. She also was the coding director for STEMgirls and is a board member of the STEAMpark teen board. Additionally, Sophia was a teaching assistant for an engineering class at the Stars Challenge. She is also the community engagement editor for the Pixel Journal at Stanford Online High School. She hopes to study philosophy and applied mathematics in the future and work on artificial intelligence.