

The Effects of SARS-CoV-2 on Mental Resilience and Physical Health

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On my honor as a University Student, I have neither given nor received
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Introduction

Last month, the world observed the first full year since the beginning of lockdown and international frenzy due to SARS-CoV-2. One full year of quarantining, wearing face masks, and having limited social and physical contact with friends, family, and society. While promises of global vaccination are helping to bring back a state of normalcy, there is still a very long road to get back to the lives we had just a little over a year ago. Due to the global pandemic, advancements have been made in face mask technology and social safety measures. The goal of this paper is to analyze the effect the Corona Virus has had on mental resilience and physical health on society as a whole.

The most apparent change to daily life has been the introduction of wearing face masks. Face mask technology is by no means an innovation resulting from Covid-19. However, the widespread and continuous use of face masks has resulted in a variety of coverings to be introduced. With this assortment of face masks, there comes a range of aesthetic styles and filtering effectiveness that could make one type more advantageous than others. While it may seem apparent that wearing a face mask offers protection from the virus, over a quarter of people interviewed in a Gallup Poll said that they seldom or never wear a mask; some claims for not wearing masks stem from the examples that several public figures previously set, existing health conditions, or claiming masks take away American freedoms (Brenan, 2020).

Many masks offer less than ideal protection when compared to medical grade masks (Ablondi, 2020). Therefore, issues with effectiveness and aesthetics led to the inception of the proposed capstone project; designing an air-powered face mask that will filter intake air, exhaust air, and will be easier to breathe in compared to other recommended masks, while maintaining a more aesthetic appearance. Designing a mask which excels in comfort, filtration, and aesthetics

could become the gold standard or most commonly used mask for all of society, and potentially help society return to a state of somewhat normalcy sooner than traditional masks.

Covid-19 has taken hundreds of thousands of American lives, many freedoms, and even left society as a whole physically, mentally, socially, and emotionally broken or stressed (Rossen, 2020). Everyone has felt the strain of the virus in some way, shape, or form. Global quarantining will have a lasting effect on many things that are taken for granted everyday: less commuting to work, more food delivery services, and even new communication platforms to reach out to friends, coworkers, or loved ones who are far away. Overall, the negative side effects of the virus, like the lack of physical activity and social interactions, outweigh the good. The goal of the proposed STS research paper is to analyze how the virus has had an impact on humans with a focus on physical fitness and mental health. Ideally, with the combination of preventative technology (like face masks) and other health safety practices, there will be a quicker end to the global pandemic, and maybe even help society be more prepared for the next one.

Literature Review

The Coronavirus, and societal responses to it, can be viewed and analyzed in a variety of ways. As time passes and opinions change about the virus, so do the means of effectively analyzing it on a larger scale. The two main ways in which the technical project and STS research paper tie into one another and can be analyzed are through the lenses of Paradigm Shift and Wicked Problem Framing.

A Paradigm Shift is a change in perspective or practice due to the introduction of a new method or technology, in this case the virus itself. This framework was created by Thomas Kuhn, an American Philosopher who emphasized these shifts open up new ways to observe situations

and could result in a backlash or critiques. One main critique of the Paradigm Shift is that there is a complete abandonment of previous thought to a new and novel one (Kuhn, 1962). In the context of Covid-19, this critique will be considered while moving forward and as policies and restrictions keep on changing.

The Coronavirus can most easily be seen as a Paradigm Shift as most of our daily lives have radically changed since the early months of 2020. Many public freedoms have been restricted in an attempt to reduce the spread of the deadly virus. This shift is shown through the work of Nicholas Bloom, a Stanford economist, which shows that 42% of full-time US labor is now working from home (Wong, 2020). With this new ease of doing activities, which would often take time for travel, instantly from home comes a new challenge of more isolation and laziness. Everyone is having to relearn things and adapt life to accommodate the new era of Covid-19; this extends especially to physical activity and exercise. Regular exercise has shown to be beneficial for long-term health. More importantly in a quarantine society, working out can help things like depression, anxiety, mood, and social interactions (Psychiatry: Michigan Medicine, 2020).

A combination of fewer social interactions and work or school being moved online has negative effects on an individual's mental health. Society as a whole has gone from having large concerts and sporting events with tens of thousands of spectators to not being able to eat lunch in groups no larger than two (as shown by an old UVA Covid mandate). This lack in social interaction has been shown to have an impact on everyone's mental health in one way or another. Even more seriously, mental health related occurrences, such as depression, suicidal thoughts, and drug use has increased due to the lack of social interactions and quarantining for an extended period of time (Kamal & Panchal, 2021). The overall results of the Coronavirus on mental health

have not been for sure, but these increased trends seem to show that this new lifestyle, one which the majority of people are living, is having a negative impact on mental health, whether we realize it or not (Warren & Smalley, 2021).

Additionally, differing perspectives about the Coronavirus and how society should deal with it is considered a Wicked Problem. A Wicked Problem, originally introduced by Horst Rittel and Melvin Webber, is one that has no clear definition, involves many different perspectives, and has changing constraints over time (Seager, 2011). Some people believe the virus is completely made up while others believe it is the plague. This difference makes it clear that there is not a unified stance on what the problem actually is or how we should go about fixing it. Additionally, there still is not conclusive evidence about what the long term effects of the virus will be (Mayo Clinic Staff, 2020). One critique of the Wicked Problem framework is that it promotes an idea that there is no true, successful answer to a problem. In order to address this problem, it must be noted that there will never be a unified problem framing or solution to the Coronavirus. However, this does not mean that steps should not be taken to help prevent the transmission of the virus; having an agreed upon, correct answer or not, plan to take any steps forward is better than remaining stagnant.

Not everyone views the severity of the virus the same way, and as a result affects an individual's actions. Some people who are more conscious about the virus may take extra precautions above what is required or recommended by government health officials. On the other hand, some people practically think the virus is nonexistent and won't even go as far as to wear a mask in public places (Brenan, 2020). These two different perspectives, albeit more or less the extremes, cause a societal problem as interactions take place between those that follow virus

guidelines and those who do not. This division in thought and actions could result in unnecessary conflicts and ultimately a longer time to endure societal restrictions and a return to normal life.

Perspectives on mental, social, physical, and emotional health can also be viewed as a Wicked Problem. These are more of a result of the previously stated difference in attitude towards the severity of the virus. Everyone has a different perspective on health and what works well for the individual. Therefore, opinions and actions about different facets of health is more of a case-by-case basis and could cause conflict between individuals. While everyone is entitled to their own freedoms and thoughts, there still seems to be a general answer to the Wicked Problem at hand: to comply with restrictions and follow safety protocols to bring a more abrupt end to the pandemic. Sometimes you have to do what is best for the whole of society even if it conflicts with personal ideals or is difficult to comply with.

The frameworks of Paradigm Shift and Wicked Problem Framing lead to a more wholistic conversation about the ethics of quarantining and following safety guidelines. Specifically, the concept of utilitarianism, or making decisions that will positively impact the greatest number of people. Individual's actions should be made more selflessly under this framework in order to benefit a larger cause or community. In the case of Covid-19 and different reactions and perspectives, following every safety protocol exactly could seem a little unnecessary; especially if an individual has already been infected or is completely vaccinated. Everyone has probably broken some sort of safety guidance in the past year of quarantine. However, continued, intentional noncompliance is nonutilitarian as actions are made for personal reasons and not for the positive impact on society. Basically, follow the guidelines, be ethical, and maybe society will return to normal a little faster.

Methodology Section

There are many ways to analyze the effects of the Coronavirus, and new information and statistics seem to come out almost daily. For this reason, the research paper will take into consideration the most relevant and up to date sources as possible. The research methods for this project will include autoethnography and discourse analysis of other existing literature.

Since Covid-19 is still a relatively new global phenomenon and just about everyone in the world has been affected by it, a personal account, or autoethnography data collection, can be implemented. Additionally, metrics and research made by other people or institutions will be helpful for analyzing the STS research topic. Personal experiences are extremely important to understand how Covid-19 has impacted society on a larger scale as we are all living through the restrictions and radical lifestyle change every day. It should be noted that some new information that comes out in a study or article could be turned over the next week. Therefore, all information researched from different resources was considered and compared to get the most accurate, and up to date, information as possible.

All of the proposed methods are meant to gather as many perspectives and opinions about Covid-19 as possible in order to track common thoughts or misconceptions about the virus. Responses and information found online, through discourse analysis, will help to answer the research question by gathering personal testimonies about the effects of the virus on health and wellbeing. Greater institutions who have collected more extensive data on the virus would be more useful in the grand scheme of things than anything a single undergraduate student with limited knowledge and research capabilities could. Therefore, big picture topics addressed in this paper will be compared and contrasted from official publications from universities or

professionals to see the difference or similarities between the global and local perspectives of the pandemic.

Throughout the pandemic, there have been constant online articles published about staying physically, mentally, and socially healthy in a largely shut down world. Many of these offer tips and tricks on how to exercise at home or remain connected to friends and family even if we are not allowed to meet in person. Many of these articles, which have been referenced throughout this paper, offer helpful suggestions that often confirm or build off other credible sources like the Center for Disease Control, Mayo Clinic, and World Health Organization. Therefore, the sources used for this project can be considered credible and justifies the methods used for data collection.

Face Mask Design

The impetus for the technical deliverable was analyzing current face mask technology and looking at how it could potentially be improved. Ideally, a perfect face mask that is widely used by an entire society could bring about a quicker return to public, in person interactions. Previous technologies, like Powered Air-Purifying Respirators (PAPRs) and Surgical N95 grade filters, were analyzed and modified in an attempt to make something better for widespread use (CDC, 2020). Therefore, the following criteria were deemed to be important and became the main focus of the project: long term comfort, visual appeal, and overall filtration ability.

Since masks are required to be worn for most in person settings, this would mean an individual would need to wear a mask for a long period of time at work, or just as they go about their day. Therefore, designs were centralized around a typical 8 hour workday and finding a design that would be pleasant to wear for that period of time. Comfort was deemed essential for the actual connection made with the face, so a soft foam lined CPAP mask was used to have a

more enjoyable long-term wearing experience. Additionally, breathing with the mask would ideally feel like the individual using the device was breathing without a mask at all! Basically, instead of having a hot, stuffy breathing experience with other masks, the technical deliverable would have fans to assist the user in breathing by almost simulating a gentle breeze inside of the mask. Therefore, if a mask is snug on the face, without causing long term irritation, and provides a more natural breathing environment, users may be more inclined to wear the designed mask more in person for longer periods of time. Comfort is one of the main obstacles to overcome for long term wear, but so is aesthetic appeal.

Most people would not voluntarily wear a clunky and obnoxious face mask for hours on end because of bringing unwanted attention to themselves. For this reason, the look of the mask was also deemed to be very important. Aesthetically speaking, size, color, and shape were the main factors to consider. The smaller the mask, while still maintaining the same filtration effectiveness, the better. Also, the design of the filtration pods was adjusted to stay as low and away from the user's field of vision as possible. However, as design iterations went on, there was a slight shift in aesthetics. A clear mask was used to allow for more normal human interactions, like being able to read someone's facial expressions. Since the completion of the technical deliverable, other companies have designed similar, better developed face masks that aren't clunky and are clear so the mask is as discreet as possible.

Besides the main components of the face mask: fans, filter, and mask, the strap and battery were considered to be important design aspects of the project. The battery selected would need to power the two fans for a full day at work and be small as to not cause discomfort or hinder the aesthetics of the mask. Originally, the battery was going to be placed somewhere on the mask or attached to the headband. However, it became apparent that the battery selected was

too cumbersome to work comfortably while attached to the head. It was placed in a necklace type of device that could be worn by the mask's user. Additionally, the type of mask strap was considered in depth and the final design included a modified ski goggle strap. The ski goggle strap offered the widest strap, which would reduce pressure on the user's head, while offering the best ability for adjustment and modification. The strap was modified by cutting some material away from the location where it would interact with a user's ears. This too helped to remove pressure points and help for long lasting comfort. Additionally, mask straps could be customized with different designs to make them more personalized and unique. Further design of the facemask would need to focus on these areas in order to meet the overall goals of comfort, effectiveness, and aesthetic appeal.

Arguably, the most important design aspect is the mask's ability to effectively filter out any potentially harmful particulates. Many different types of filter materials were considered, tested, and modified throughout the technical deliverable's life. High quality, medical grade material was considered and used in the fan powered face mask design. Another consideration for filter effectiveness was the replaceability of filter material. As an individual uses a mask and exhales into the material, the mask becomes slightly saturated and the material filtering capability is reduced. Therefore, it would be advantageous to use a design that allows for an easy replacement of high-quality filter material throughout the day. For this reason, a mask with separate intake and exhaust fans, called pods, would have covers with filter material that snap on and off from the rest of the mask, all while theoretically providing an airtight seal between the mask and the removable part of the pods. All of these components went into the design of the technical deliverable that was worn and tested by members of the design group.

The design process and prototype iterations were informative about some of the main principles of engineering. Designs for this face mask were still quite primitive and could use a little more work and iterations of concepts and designs. The main idea was achieved, but with some areas that still needed improvement. The final, polished deliverable upon assembly was a little rougher than anticipated. Additionally, the filter pods could use a deeper examination to make sure the parts are airtight, therefore keeping any viruses from getting around the filter material, and less cumbersome. Finally, the battery connection to the fans could be reworked had there been more time to work on the project. It was interesting to see similar products come about that incorporated fans in a clear face mask after the project deadline had passed. The design group's idea appeared to be on the right track for other companies' designs.

Conclusion

Society is getting closer to a state of normalcy each and every day. With continued advancements in technology and vaccines being administered at a high rate, hopefully the quarantine and restrictions in place due to Covid-19 will become a thing of the past. However, who is to say that a more developed and effective face mask like the technical project, or a similar product, wouldn't have been able to bring about this normalcy a little faster? While face coverings are not the silver bullet for preventing the spread of viruses and pathogens, effective face masks are one of the best pieces of technology a person can use to protect themselves while maintaining public and social interactions.

Developments in face mask technology will leave a lasting impact on the future of society. Companies that have spent millions of dollars on developing comfortable, aesthetic, and highly effective masks will not have wasted their money even as the Coronavirus is seeming to come closer to its end. If, more like when, there is another pandemic in the future, mask

technology will already be a well-developed resource that can be implemented almost right away; hopefully bringing the amount of time in that pandemic down significantly.

Having a well-developed face mask or not, there are some social and physical interactions that have been limited over the past year which have made life abundantly less healthy and more challenging. Simply not being able to go outside or to a gym for exercise has been found to have a negative effect on physical, social, mental, and emotional health (Rucker, 2020). Covid-19 has made going to the gym and staying active more difficult due to businesses closing and individuals following strict quarantine guidelines. Even from personal experience, day to day life has become more sedentary. This change is extrapolated to society and the world as a whole, where jobs and school have moved to an online platform. Besides physical inactivity, which could be even more dangerous for those with preexisting health concerns, quarantining leads to people feeling socially isolated from others, and experiencing degraded mental and emotional health (Rossen, 2020). Therefore, working out and staying active offers more health benefits other than to just build physical strength and cardiovascular endurance; which is also believed to preserve our health and make individuals more resilient to the virus (Rucker, 2020).

The completion of both projects will hopefully help to educate individuals about becoming and staying physically and mentally healthy during the Covid-19 pandemic, virus prevention techniques, and the benefits of wearing masks. The capstone design deliverables and research done should help to more effectively prevent the spread of the virus and hopefully shorten the amount of time until society is able to return to a Covid-19 free environment; one that everyone lived just a year ago.

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