

## **Thesis Project Portfolio**

### **Development of a Powered Air Purifying Respirator (PAPR) for Runners**

(Technical Report)

### **An Examination of Cultural Attitudes Toward Mask Use Through Social Construction of Technology**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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### **Sociotechnical Synthesis**

The goal of this project was to address mask use from two different perspectives. The STS research focused on the values held by different social groups that might lead those groups to wear or not wear masks. The technical research focused on only one social group, runners, and the creation of a powered filter mask for running. The goal of both aspects of the project was to encourage mask use, since increased mask use has been shown to reduce both the spread of COVID-19 and mortality due to COVID-19.

The goal of the technical research was to create a comfortable, low-cost powered air purifying respirator. A mask was designed and built that uses a breath sensor to detect the user's breathing and filter air into the mask when the user breathes in, and out of the mask when the user breathes out. This design is more comfortable than a cloth mask and is less expensive than other powered air purifying respirators. It also provides greater protection from COVID-19, since other powered air purifying respirators only filter air into the mask, while the new design filters air both in and out of the mask.

The goal of the STS research was to use the ideas of technology domestication and social construction of technology to define values and attitudes toward mask use among different social groups. The United States and South Korea, two countries with different social values and rates of mask use, were used as a case study. This information was used to recommend strategies to encourage mask use in the United States, where rates of mask use are lower. Based on the fact that Americans tend to value individualism and that the United States is in an earlier phase of mask domestication than South Korea, it was found that approaches that emphasize the individual benefits of mask use are more likely to be effective.

This research attempted to address multiple reasons for resistance to mask use: the technical research provided a solution for the physical discomfort of mask wearing, while the STS research recommended strategies for overcoming social reasons for resistance to mask use. Mask wearing is important to public health, and the reasons for adoption of or resistance to masks are multifaceted and can't be addressed with just one approach.

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