

# Mask /Gaiter Efficacy Test 1

## September 2020

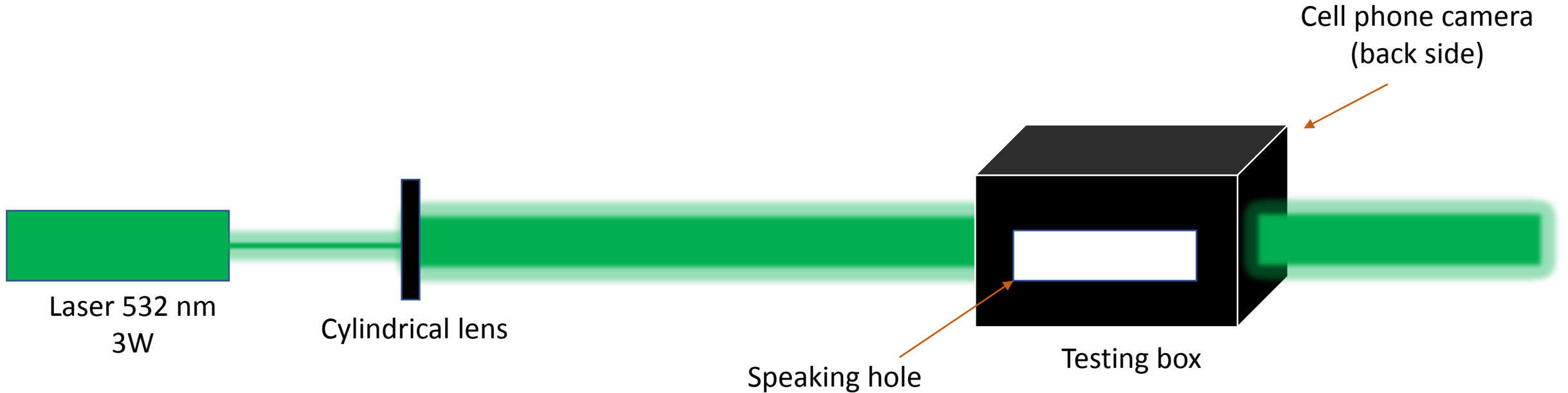
**Purpose:** *Test the effectiveness of masks and gaiters with respect to reducing disbursement of respiratory droplets during speech*

*Confidential – property of University of Georgia – not for publication or distribution*

# Part 1

# Experiment Setup

*Confidential – property of University of Georgia – not for publication or distribution*



We followed the method in the Science Advances paper. The main points are:

- Laser power: **3W**
- Box size: **25 x 25 x 30 (cm)**, 3D-printing a new box.
- Camera setting:
  - Resolution: 1920 x 1080, 1/50s, 1600 ISO, 30 fps, 15 cm focal length.

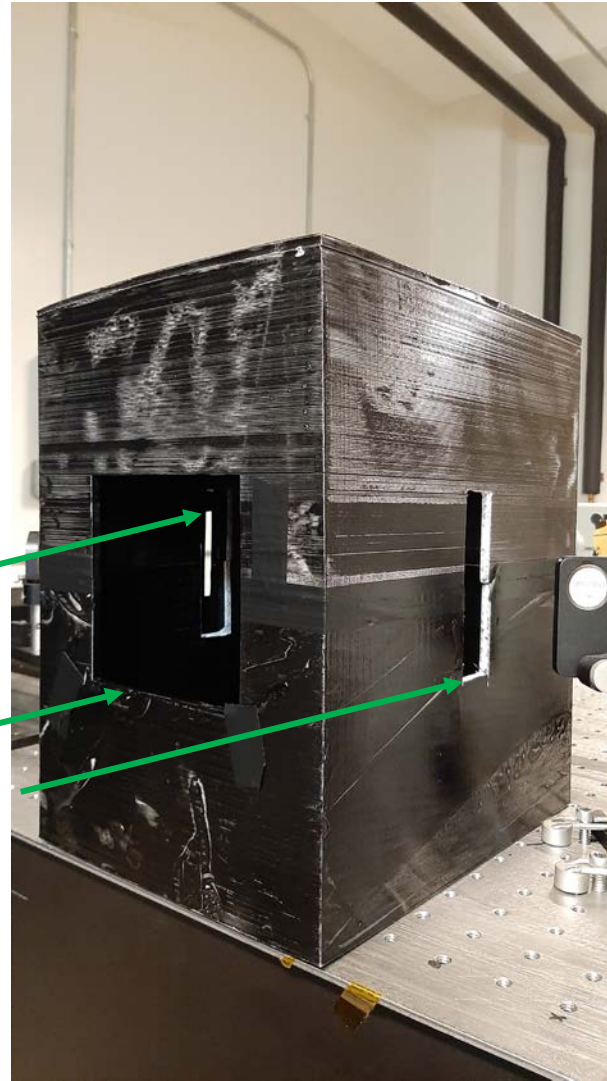
*Confidential – property of University of Georgia – not for publication or distribution*

- A 3D-printed box was used to reduce air particles
- Testing conducted in a Class 1000 clean room

Laser entrance

Speaking hole

Laser exit



*Confidential – property of University of Georgia – not for publication or distribution*

# Part 2

## Testing Procedure

We followed the method in the Science Advances paper, entitled “Low-cost measurement of face mask efficacy for expelled droplets during speech.” The main points are:

- Each mask and gaiter was tested while worn on an adult male.
- Each mask and gaiter was tested three times.
- Total time was **40 seconds** for each test:
  - First **10 s**: observation, no speaking.
  - Next **10 s**: Minh will speak “stay healthy, people” 5 times to the speaking hole.
  - Next **20 s**: observation, no speaking.
  - Between 2 tests: drink water to avoid dehydration.

*Confidential – property of University of Georgia – not for publication or distribution*

## **Materials tested consisted of the following:**

Four of the top-selling, two-layer face masks offered on Amazon.com

- To qualify, masks had to receive no less than 2,000 consumer reviews with an average rating in excess of 4.0

- Masks were made of various materials (Cotton and Spandex)

Five of the top-selling, single-layer gaiters offered on Amazon.com

- To qualify, gaiters had to receive no less than 4,000 consumer reviews with an average rating in excess of 4.0

- Gaiters were made of various materials (Polyester, Spandex and Nylon)

Three multi-layer gaiters offered on Mission.com

- Gaiters were 2 and 3 layers, made of Polyester and Spandex

*Confidential – property of University of Georgia – not for publication or distribution*

# Part 3

## Analysis Procedure

Each frame in the video was analyzed separately.

On each frame, the data was analyzed using the following flow:

- Subtract video for a reference frame (background frame).
- Remove any pixel with the intensity  $< 20$  (threshold filter).
- Remove salt and pepper noise (using Matlab toolbox).
- Convert the frame into a binary map.
- Count and track particles using `bwlabel`, `bwareafilt` functions and `tracking.tar.gz` module in Matlab.

*Confidential – property of University of Georgia – not for publication or distribution*

# Part 4

## Results

Single-layer gaiters provided a 77% average reduction in respiratory droplets compared to wearing no face covering at all.

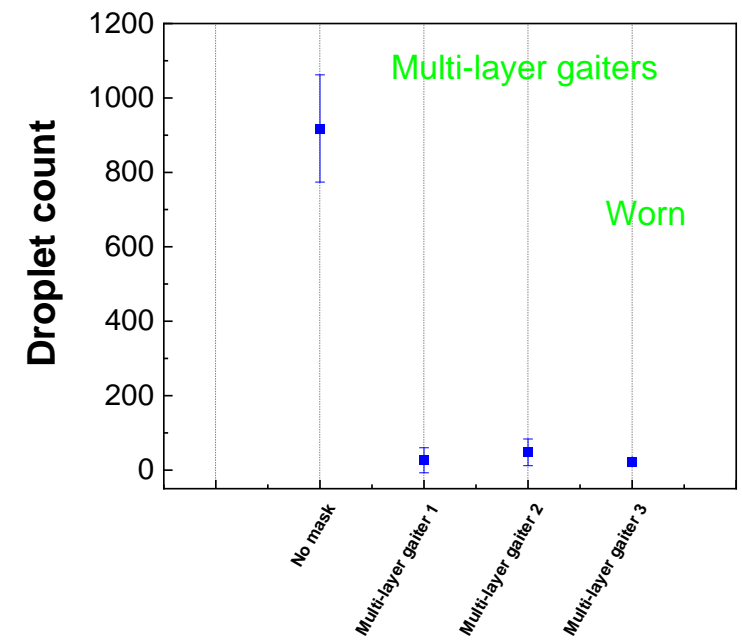
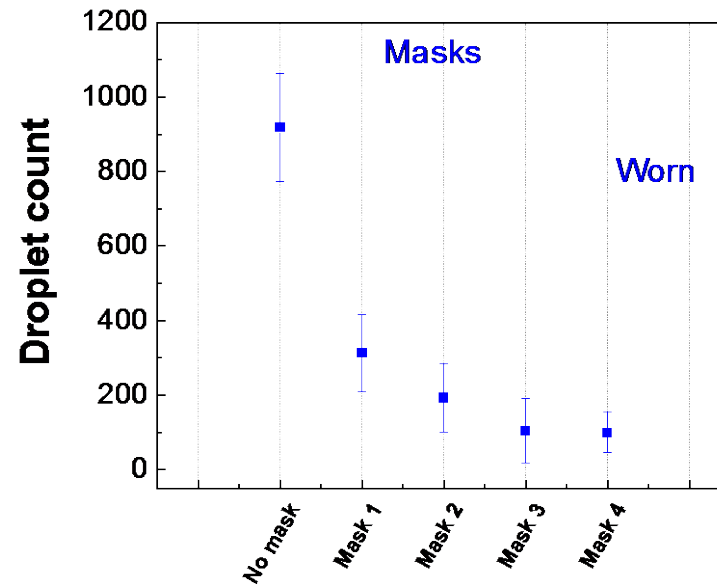
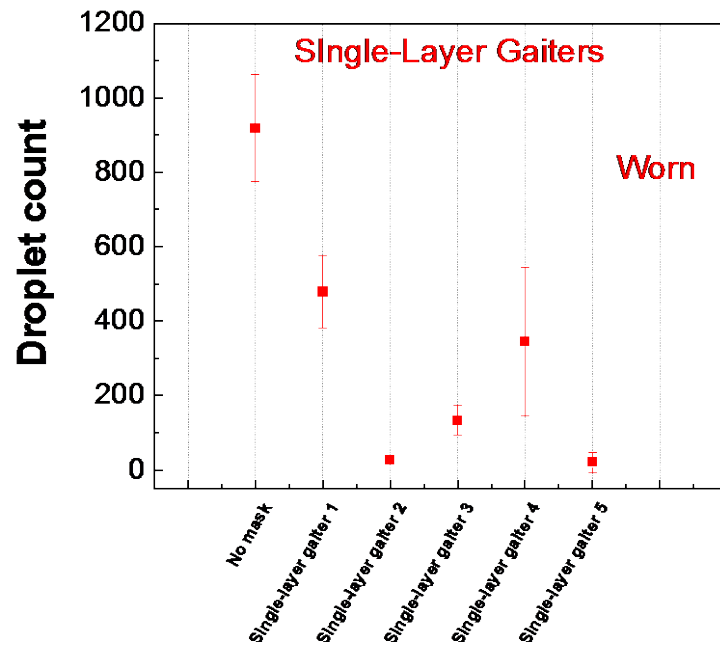
Two-layer masks provided an 81% average reduction in respiratory droplets compared to wearing no face covering at all.

Multi-layer gaiters provided a 96% average reduction in respiratory droplets compared to wearing no face covering at all.

*Confidential – property of University of Georgia – not for publication or distribution*



We estimated the error bar by the standard deviation of 3 measurements. The points in these graphs are average counts of 3 measurements.



Confidential – property of University of Georgia – not for publication or distribution

## Summary:

On average, the single-layer gaiters that were tested performed substantially similar to two-layer masks in reducing the disbursement of respiratory droplets during speech.

The multi-layer gaiters that were tested all performed better than two-layer masks in reducing the disbursement of respiratory droplets during speech.

The level of protection provided by a face covering appears to be substantially driven by the number and quality of layers of material and not whether it's in the form of a gaiter or a mask.

# Part 5

## Study Leaders

**Suraj Sharma**, Professor of Polymer, Fiber and Textiles Sciences in the FACS  
Department of Textiles, Merchandising and Interiors

**Tho Nguyen**: Associate Professor of Department of Physics and Astronomy

*Confidential – property of University of Georgia – not for publication or distribution*

# Mask /Gaiter Efficacy Test 2

## Scheduled for October 2020

**Purpose:** *Test the effectiveness of masks and gaiters with respect to resistance to penetration of synthetic blood aerosol under pressure.*

*Confidential – property of University of Georgia – not for publication or distribution*

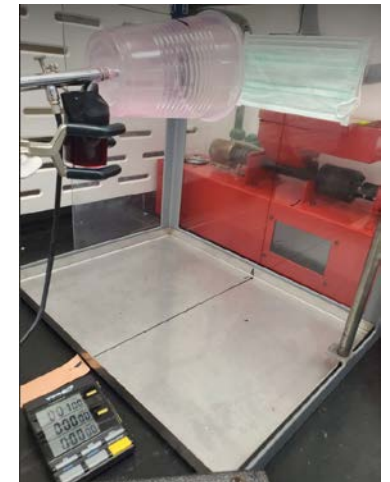
# MODIFIED TEST SET-UP: from ASTM F1862 Resistance of Medical Face Masks to Penetration by Synthetic Blood (Horizontal Projection of Fixed Volume at a Known Velocity)

Compress Synthetic Blood Flow, 20 kPa at 37°C for 1min

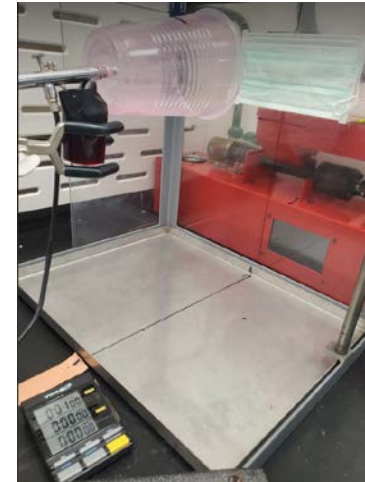
Synthetic Blood at 37°C

Compress Synthetic Blood Flow, 20 kPa at 37°C

Mask Holder



# TEST PROCEDURE



**Visual inspection front of fabric**



**Visual inspection back of the fabric**



0.1 ml synthetic drop on back of the fabric as a reference

Compress Synthetic Blood Flow, 20 kPa at 37°C for 1min

*Confidential – property of University of Georgia – not for publication or distribution*

Media Contact: Cal Powell, Director of Communications  
College of Family and Consumer Sciences  
[jcpowell@uga.edu](mailto:jcpowell@uga.edu)

*Confidential – property of University of Georgia – not for publication or distribution*