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What Kind Of Mask Works Best Against Covid-19?

Helen Albert Former Contributor
Healthcare
I write about digital healthcare, biotech & innovation in medicine.

Now that we are several months into life with Covid-19, many countries are trying to get back to normal and reopen workplaces, shops, schools and other venues.

While there has been some considerable debate about the wearing of masks in the US, with Trump and other senior politicians promoting an anti-mask message, most health authorities agree that wearing masks can help to stop the virus from spreading.

Research published this week by Goldman Sachs strongly supports a national mask mandate in the US and suggests that implementing one could prevent a 5% loss in GDP (around or $1 trillion) that could be caused by continued lockdown.

Indeed, many governments in Europe and elsewhere have already accepted the advice from health experts and implemented mandatory mask wearing on public transport and in shops, as well as some other public spaces.

Passengers, wearing protective masks amid the COVID-19 pandemic, ride the light rail train in the ... [+] AFP VIA GETTY IMAGES

With mask wearing becoming the norm, retailers have jumped on the bandwagon to provide them to customers in vast numbers. You can now buy a bewilderingly huge range of different masks and for those that are more creative (or who just can't find a shop with masks in stock) there are also a wide range of mask patterns that you can make yourself.

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But, are all masks alike when it comes to how protective they are? Research from Florida Atlantic University published today suggests not.

Siddhartha Verma, an assistant professor at the university, and his colleagues simulated coughs and sneezes using a mannequin head and measured how protective different mask designs and materials were at stopping droplet spread using laser imaging.

“All of the major health agencies have now issued recommendations for the general public to use some sort of face covering. But there are no clear guidelines on the types of material or designs that should be used,” explained Verma.

“While there are a few prior studies on the effectiveness of medical-grade equipment, we don’t have a lot of information about the cloth-based coverings that are most accessible to us at present, given the need to reserve medical-grade supplies for healthcare workers.”

Verma and his team first tested how far droplets from a heavy simulated cough would travel, before testing four types of commonly available masks to see how well they blocked the droplets. A folded handkerchief style mask and a home-made cotton, two-layer, sewn mask – both as advertised by the CDC – a single layer, bandana type mask and a commercially available, non-sterile, cone-shaped mask.

“We found that tightly woven fabrics, specifically quilting cotton, was the most effective in preventing leakage through the mask,” said Verma. The mask they tested was made of two layers of cotton of 70 threads per inch, although the authors noted in their paper that the bandana fabric also had a tight weave so this was not the only reason the stitched mask was effective.

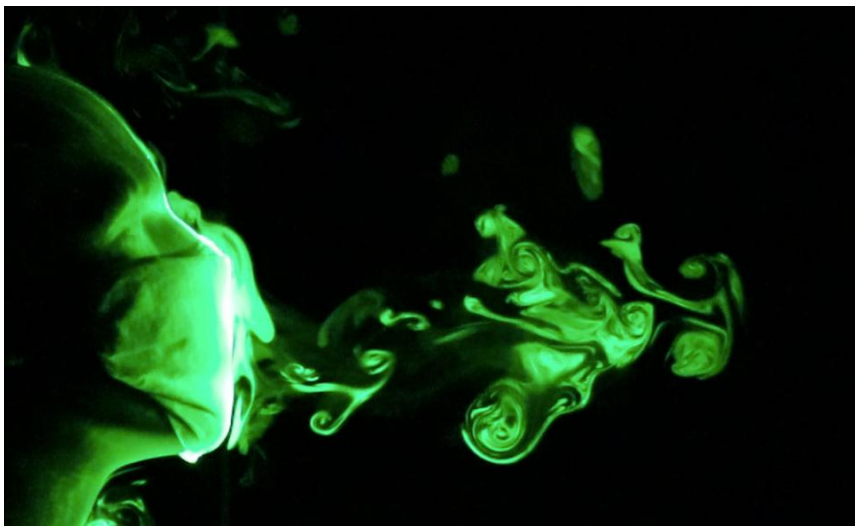

Image showing how liquid droplets from a simulated cough can pass through a face mask constructed ... [+]
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Of the other three masks, the cone shaped mask was the next most effective at stopping droplet flow, followed by the handkerchief mask and the bandana. Both the handkerchief mask and the bandana allowed quite a high degree of droplets to leak through, although they did reduce the distance the droplets travelled considerably compared to no mask at all.

Somewhat concerningly, the uncovered simulated cough travelled much further than the 6 feet current CDC guidelines suggest. While the researchers say there was quite a bit of variation in the distance droplets from the simulated cough travelled, they frequently travelled further than 6 feet and sometimes up to 12 feet in less than a minute.

Verma says that the fit of the mask is also important, as they noticed that leakage also occurred at the edges of the masks where there was not a good seal.

“We observed leakage from the sides and the top, even when using the quilting cotton mask. While some leakage is unavoidable, a good fit can help minimize the spread,” he emphasized.

The research team hopes the information they collected will help people to pick the best mask they can, but also urge caution about assuming masks are all protective.

“It is also important to understand that face coverings are not a 100% effective in blocking respiratory pathogens,” noted Verma. “This is why it is imperative that we use a combination of social distancing, face coverings, hand-washing and other recommendations from health care officials until an effective vaccine is released.”

So, in summary, if you don’t already have a mask it’s time to connect with your inner creative and get out the sewing machine – many patterns can be found online. Or alternatively reconnect with that crafty friend or family member and ask for their help.

Construction of a homemade cloth face mask, based on the guidelines and sewing directions provided ... [+] GADO VIA GETTY IMAGES

“For minimizing the chances of transmission, when constructing a mask at home the best option is to use good quality tightly-woven fabric, and using a mask design that provides a good seal along the edges without being uncomfortable,” suggests Verma.

Times of crisis do sometimes bring out our inner creativity. Camila Wandemberg is a student from Ecuador studying at California College of the Arts. She became stuck in Ecuador during the last few months of lockdown, but didn’t waste the time that she had there.

She was recently awarded overall runner up in the annual Biodesign Challenge Summit competition, a collaboration between biologists and designers, for an algae-based filter she created to try and make home-made masks safer.

The cloth masks found to be effective by Verma and colleagues often have a gap for an additional filter. This can be simply something like a coffee filter, but Wandemberg decided to experiment with making algae filters with material from the pond in her garden.

“The resources here are limited, and it pains me to see people taking advantage of others by selling these products at really higher prices. I decided to create something that could

be accessible to people and cheap to make," she told me.

Although she has not yet been able to test them on a large, or scientific scale, Wandemberg came up with an innovative way to see how effective they were. "I tested my products using cornstarch. Cornstarch is the size of 0.3 to 0.8 microns in size, and cough aerosols are around the same size. I used an industrial vacuum to test the filter and how well it filtered cornstarch. It turned out to be really effective in regard to cough particles going through the filter."

Wandemberg is now hoping to scale up the production of her filters. "In the future, I would like to take this for medical testing in order to have a sanitary registration and produce these filters at a low cost and a large scale. My ultimate goal is to make a good product that is accessible to everyone."

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The research mentioned in this article was published in the journal *Physics of Fluids.*

Helen Albert

I'm a freelance science and health journalist based in Berlin. I have more than 10 years' experience writing about all aspects of life sciences, including digital... **Read More**