

## SYNOPSIS

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# Review of “Maximizing Fit for Cloth and Medical Procedure Masks to Improve Performance and Reduce SARS-CoV-2 Transmission and Exposure, 2021”

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## One-minute summary

- An **experimental simulation study using masked dummy headforms** was conducted using different configurations and modifications with **three-ply medical masks** and **three-ply cotton masks** to evaluate source control on a source model and protection afforded to a receiver under **controlled conditions**.
- **Source control:** ‘Double-masking’ or ‘knot and tuck’ on the source blocked more particles generated during a simulated cough compared to using a three-layer cotton mask alone or a three-layer medical mask alone (85.4% and 77.0% versus 51.4% and 56.1%, respectively).
- **Exposure protection:** ‘Double-masking’ or ‘knot and tuck’ modifications of a medical mask compared to unmodified medical mask use on both source and receiver, reduced wearer exposure to 96.4% and 95.9% from 84.3%, respectively.

## Additional information

- **‘Double-masking’:** A tight-fitting three-layer cloth mask over a medical mask intended to reduce gaps in face seal of the underlying medical mask.
- **‘Knot and tuck’:** A modification to medical masks which involves tying knots in the ear loops as near to the mask as possible and tucking the pinched portion of the sides of the masks into the mask. This is intended to reduce face seal leakage of the medical mask when worn. A demonstration of this method is provided in the video “UNC Health: Pro Tip to Help Your Earloop Mask Fit More Tightly” available at the following link: <https://youtu.be/UANi8Cc71A0>
- ‘Double-masking’ either on source only (82.2%) or receiver only (83.0%) reduced exposures more than ‘knot and tuck’ on source or receiver only (62.9% and 64.5%, respectively), or medical mask without modification on source or receiver only (41.3% and 7.5%, respectively).
- Experimental conditions included the use of potassium chloride particles of sizes 0.1 to 7 µm, distancing of manikins by 6 feet and in a face-to-face set-up in a chamber without ventilation.

- Limitations noted by authors were:
  - Manikins may not represent human physiological conditions and the simulated environment may not predict real-world efficacy.
  - Comfort, visibility and breathability of configurations were not assessed.
  - ‘Knot and tuck’ may not be viable for individuals with larger faces as the modification may not cover both the nose and mouth.
  - The following experiments were not conducted: three-layer cotton masks on source and receiver; cloth on cloth ‘double-masking’; medical mask on cloth ‘double-masking’; medical mask on medical mask ‘double-masking’.
  - The results are not generalizable to individuals with facial hair or children (i.e. implications for fit in these groups).
  - Only one type of medical mask and one type of cloth mask was used; therefore, results cannot be generalized to all makes and models of medical masks and cloth masks.
- Masking measures must also be paired with measures such as physical distancing, avoiding crowds and poorly ventilated indoor spaces, and good hand hygiene

## PHO reviewer’s comments

- ‘Double-masking’ and ‘knot and tuck’ of both source and receiver had similar exposure reductions. ‘Double-masking’ adds additional layers of filter material and improves the fit of the medical mask underneath the cloth mask, while ‘knot and tuck’ only improves the fit of the medical mask without adding additional layers of filter material. It is therefore not clear whether the layers of the cotton mask while ‘double-masking’ improves filtration or if the improved fit of the medical mask is solely responsible for the added exposure reduction compared to a medical mask without modifications. If the added layers of the cloth mask have no appreciable additional benefit to reduce exposure, then the cloth mask chosen for ‘double-masking’ should be based on its ability to improve the fit of the medical mask, rather than its filtration properties. Further, if the added layers have no benefit, then tests including mask fitters and braces used with medical masks could be conducted to overcome the limitation of ‘knot and tuck’ for individuals with larger faces.
- The authors suggest that the observed reduction in aerosol transmission would reduce COVID-19 transmission; however, this is an assumption that the observations are generalizable to “real world” settings. Where a tighter fit may be achieved, issues such as wearer discomfort and breathability may increase adjustments to the fit and reduce compliance, both of which may undermine the reduction in aerosol observed.
- Further experiments should be conducted to compare mask fitters and braces under the same conditions for use with reusable cotton masks to determine whether similar source control and exposure reduction may be achieved to reduce the environmental burden of disposable mask use by the public.
- Additionally, observational/epidemiologic studies on populations who use these modifications versus those who do not may further uncover if the observations are relevant to disease transmission.
- This experimental study highlights advantages of proper mask fit to increase the amount of air that is filtered in reducing exposure to aerosols.

## Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Review of “Maximizing fit for cloth and medical procedure masks to improve performance and reduce SARS-CoV-2 transmission and exposure, 2021”. Toronto, ON: Queen’s Printer for Ontario; 2021.

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