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Topic of the Speech:
Current Research and Development on Community Masks

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Dr. Simon Annaheim completed his PhD in human movement sciences at ETH Zurich in 2009 and continued his studies in exercise physiology as a postdoc for one year. He joined the Federal Laboratories for Materials Science and Technology (Empa) in 2011 to investigate local pressure impacts and wearing comfort of backpacks. In 2012, he was promoted to a scientist researching thermal and mechanical wearing comfort for clothing and carriage systems. Simon Annaheim became a scientific group leader of the Materials-Body-Interaction group in 2013 (former Body Monitoring group [2017-2019] and Heat and Mass Transfer group [2013-2016]). The research group investigates thermal and mechanical interactions of the human body with materials (textiles and carriage systems) and its environment and develops and validates numerical and statistical models. The models are applied for materials development and the prediction of thermoregulatory responses of humans exposed to extreme environmental conditions.

For the measurement of thermoregulatory and other physiological responses, the group defines the requirements for the development of textile-based sensors and the integration of sensors into textiles (in collaboration with other research groups at Empa). Finally, Simon Annaheim and his team investigate the reliability and accuracy of the wearable systems for specific applications. They aim to develop systems for continuous long-term monitoring of workers and patients for early detection of changes in health conditions. For this reason, the group closely collaborates with partners from clinics and industry. Furthermore, the provides the basis for validation purposes of thermoregulatory models as well as for the non-invasive prediction of physiological parameters (such as core body temperature) or general health conditions.

Simon Annaheim published more than 60 papers in peer-reviewed scientific journals and presented his research at international scientific conferences. He co-supervises PhD students in collaboration with ETH Zurich (Department of Health Sciences and Technology) and other universities and continuously offers open positions for master students and interns. Furthermore, he is involved in the acquisition and management of research and applied research projects in collaboration with partners from academia, clinics and industry as a principal investigator as well as a project partner.

ABSTRACT SUBMISSION
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Current Research and Development on Community Masks

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ABSTRACT (NO MORE THAN 500 WORDS:)

The COVID-19 pandemic increased awareness about the importance of hygienic health aspects, fostering innovation in different fields. This is particularly the case for facemasks being acknowledged as an effective non-pharmaceutical measure to prevent the spread of the virus and fight against the pandemic. A new textile-based mask evolved due to the increased demand for public use: the so-called community mask. Recommendations and guidelines for community masks were released by expert panels and standardization bodies specifying mask properties to ensure the protection of the community by retaining particles exhaled by the wearer (source control) while maintaining wearing comfort to achieve high wear compliance. However, the increasing evidence about aerosols being an additional critical route of transmission for SARS-CoV2 resulted in increased requirements for community masks to provide appropriate protection of the wearer.
For this reason, we identified research topics of critical importance for the development of effective community masks. The topics include achieving an appropriate filtration efficiency from multi-layer textile systems while maintaining a high wearing comfort. For the issue concerning wearer protection, a good fit and correct handling of the mask is of high importance. Comfort considerations include a low breathing resistance to avoid an increase in breathing efforts and the control of the mask microclimate, and the innocuity of the materials. Finally, textile materials' stability and robustness allow reusability of facemasks and, therefore, are of high interest concerning sustainability. Cleaning of masks shall enable hygienic application during reuse without affecting functional properties (i.e. filtration efficiency and breathing resistance). The use of masks itself might also affect their durability and was investigated by looking at different aspects, such as folding and exposure to sweat. Besides the functional and sustainability aspects, the textile-based community masks enable the application of various fashion elements such as dyeing or printing textiles. However, it is unknown how post-processing and finishing affect the functional properties of the raw materials.
This presentation aims to give an overview of the current state of knowledge about community masks on different topics as introduced above. Recent data and findings will be presented and discussed concerning existing scientific literature. With this overview, a more detailed understanding of the opportunities and challenges that come with community masks should be provided. Finally, an outlook will be provided about future directions of research and developments to develop next-generation face masks, including transparent masks to allow facial expression while wearing masks and smart masks, including sensing and actuating functionalities.
The research activities related to community masks was funded by the Swiss innovation agency Innosuisse (Innosuisse funding application no. 46668.1 IP-ENG).