

# Cooling Performance Evaluation for Performance Apparel in Hot Outdoor Conditions

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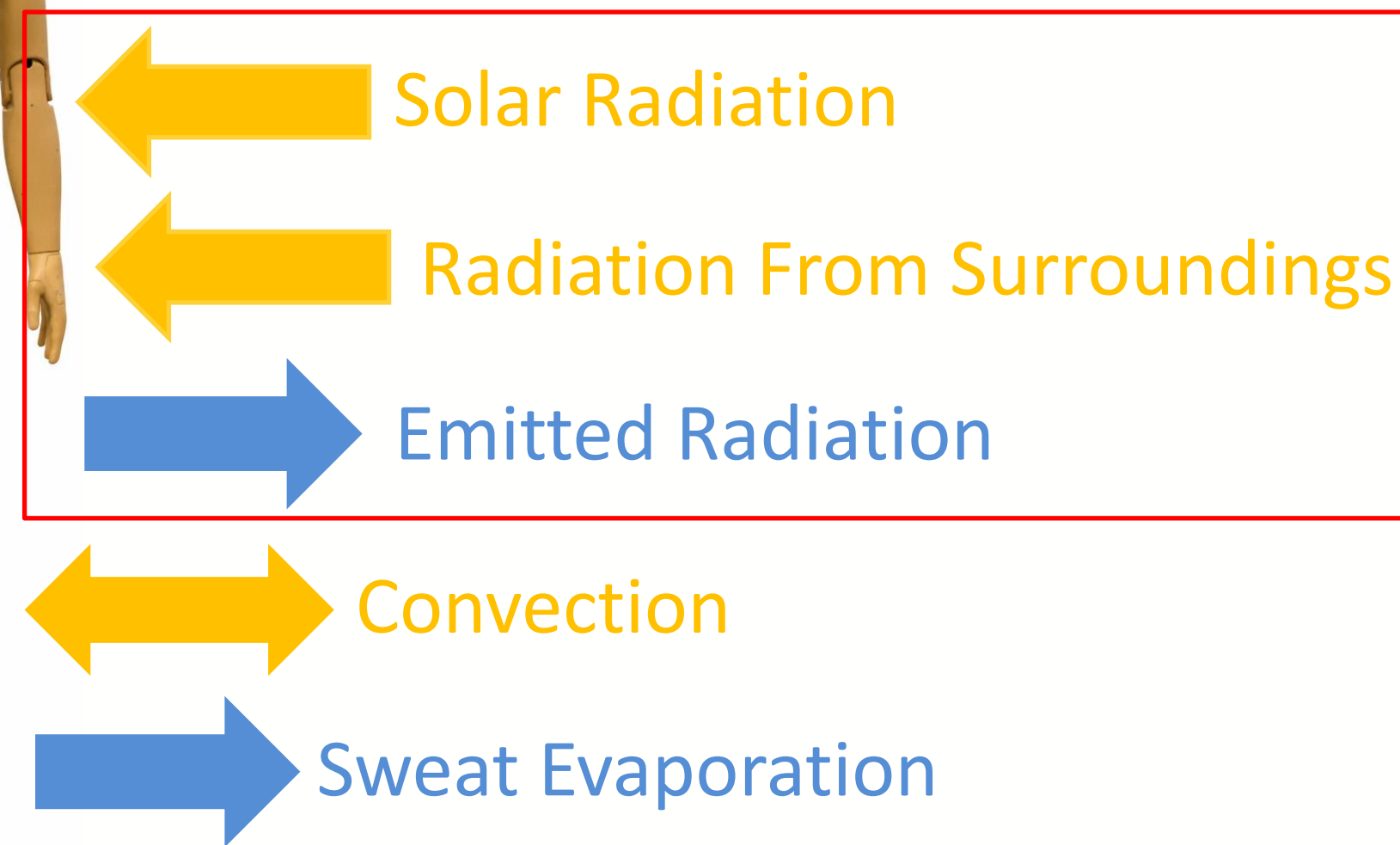
## Introduction

**Motivation:** Clothing is the easiest way to reduce extreme heat exposure. There are many “cool” clothing options but limited evidence of their effectiveness.

**Research Question:** How can clothing cooling performance be systematically tested for realistic Arizona summer conditions?

**Methodology:** Protocols were developed for using ASU’s ANDI thermal manikin in outdoor and controlled indoor environments to evaluate upper-body garments. The effects of shirt color, style, and material on net heat flux were assessed. Skin and air temperatures were equalized to isolate radiative effects, though shirt heating still introduced a convective heat load to the skin.

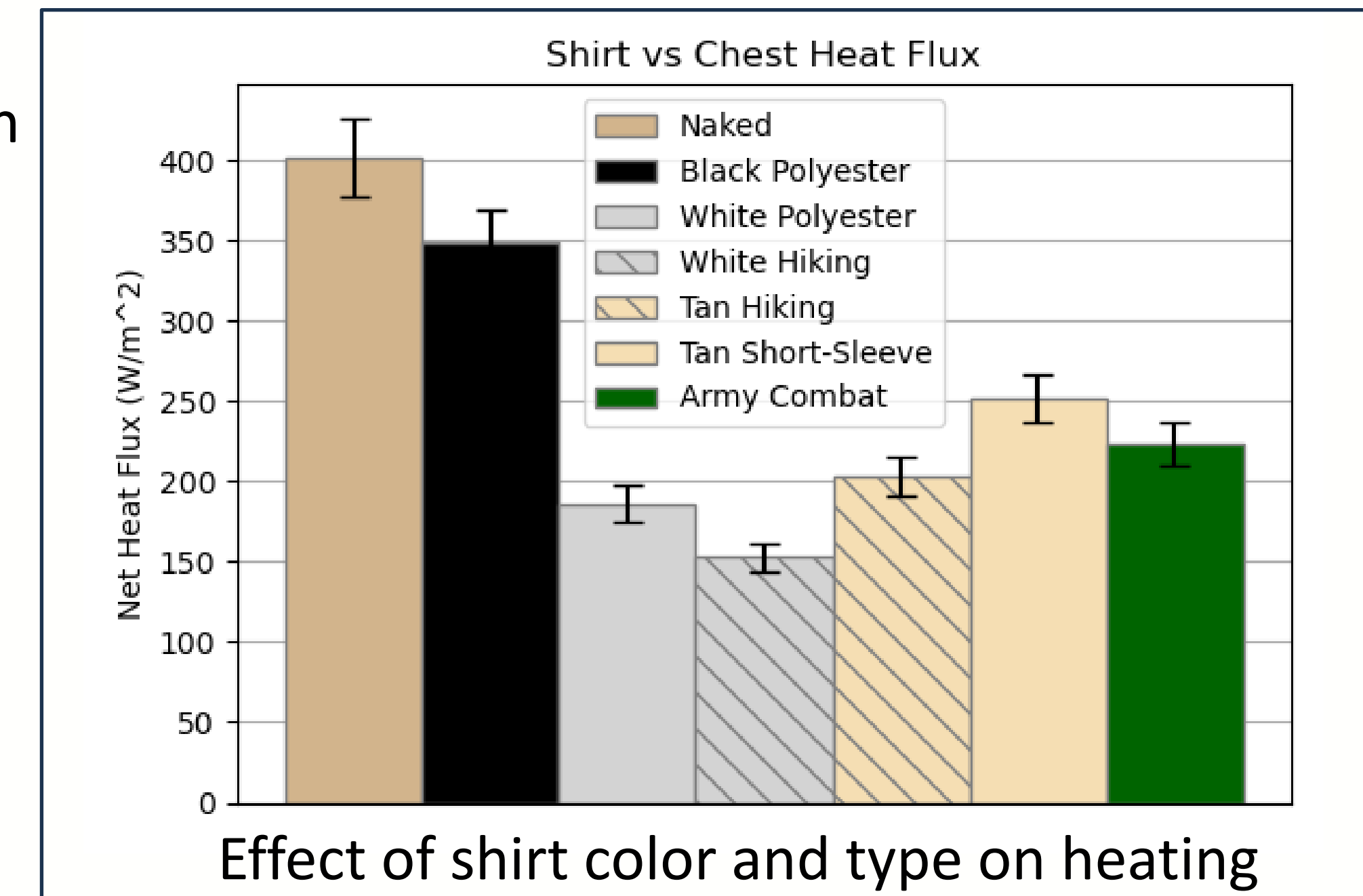
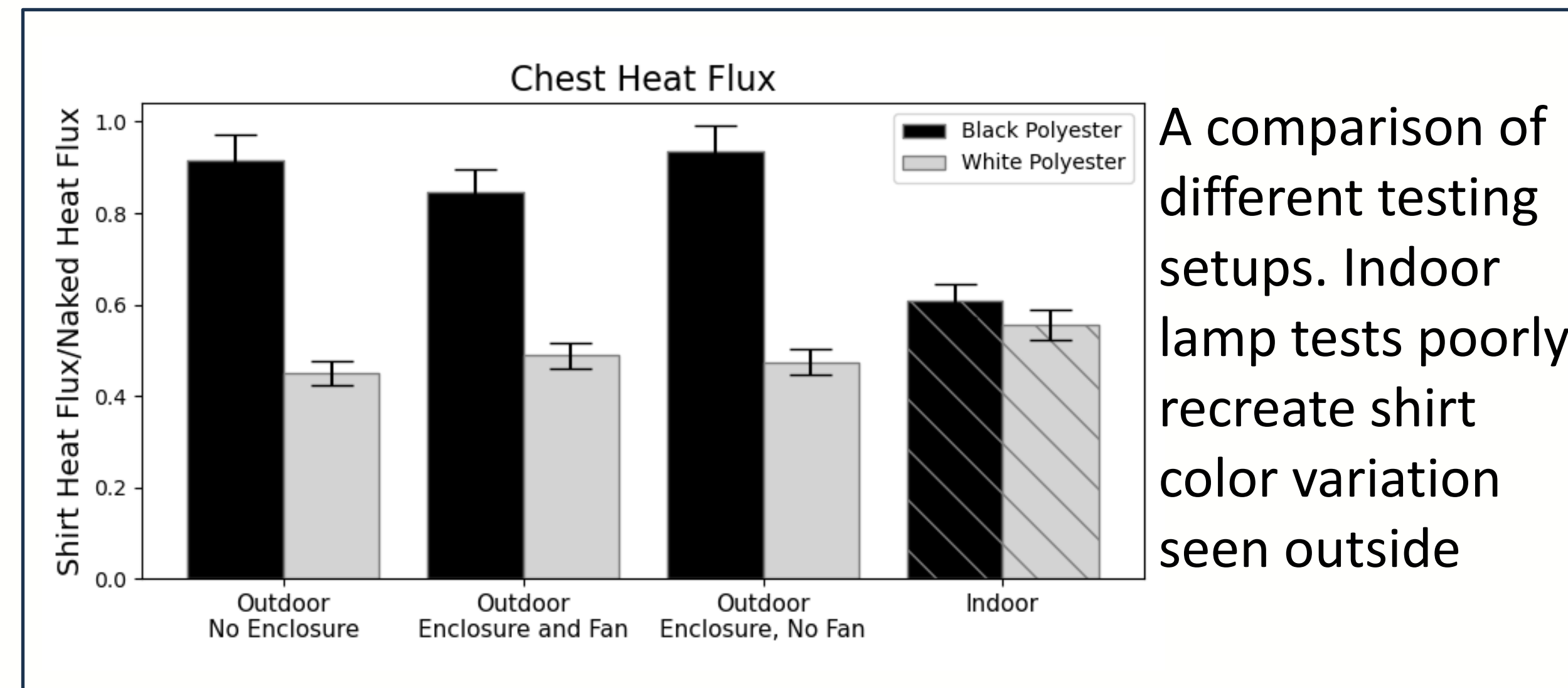
### Research Focus



## Results

Initial tests show the following:

- Halogen work lamps do not accurately simulate solar radiation
- Minimizing outdoor airflow variations with a wind enclosure has little effect on shirt performance
- Shirt color has a dramatic effect on thermal protection, especially for the chest and shoulders.

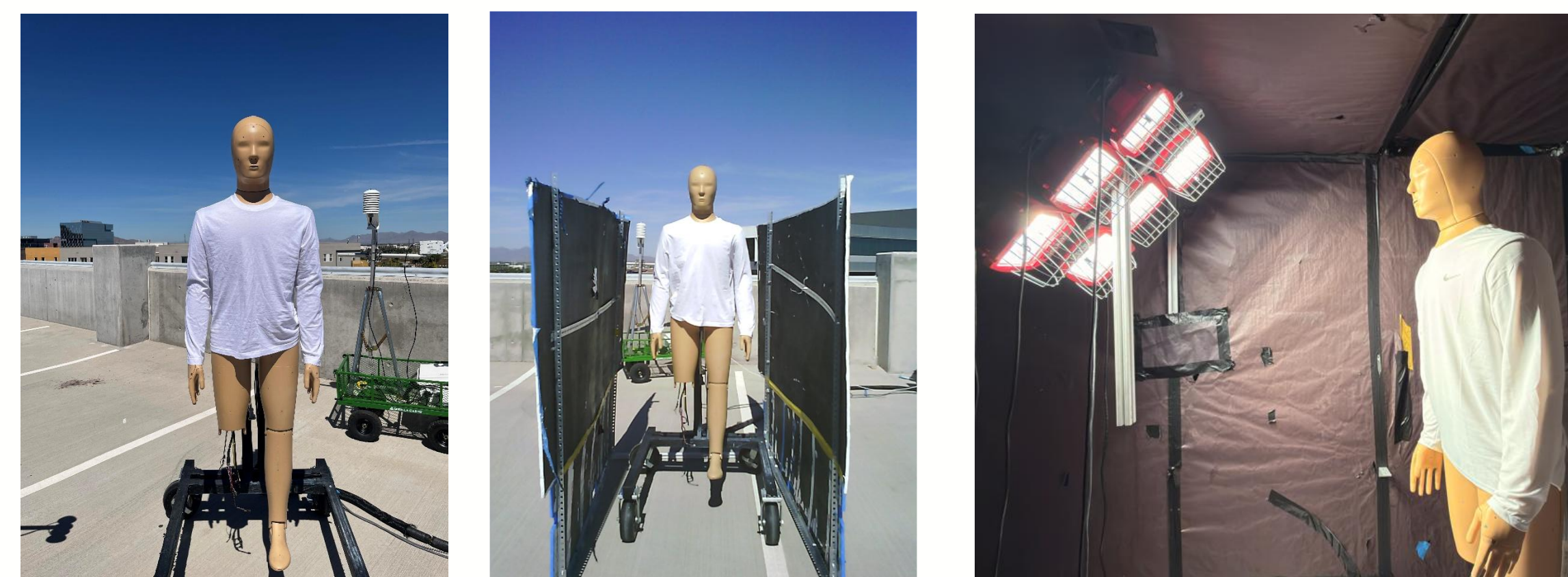


## Future Work

- Future tests will incorporate sweating to see how evaporation changes shirt performance.
- Lamps that more closely resemble the solar spectrum will be tested.

## Acknowledgements

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Outdoor testing setup with (middle) and without (left) the wind enclosure. Indoor testing with lamps (right).