Introduction

- Skin microclimate has been linked to tissue health
- Relative humidity affects friction and skin’s ability to withstand loads
- Increased tissue temperature increases metabolic demand and may affect tissue integrity
- Clinicians need to prescribe wheelchair equipment that is tailored to the needs of the individual

Objectives

- Investigate relationship between temperature and relative humidity in controlled tests
- Monitor the same parameters in everyday use and assess the impact of user functionality
- Compare measurements taken at skin and cushion surfaces to validate cushion measurements

Methods

**MSR logger**
- Temperature sensor, 0.1°C
- Relative humidity sensor, 2%
- Occupancy switch

**Controlled Test**
- Same subject, clothes & chair,
- Consistent ambient conditions
- Sensor located 2-3 cm forward of the ischial tuberosity on the skin
- Additional sensors attached to cushion surface in an analogous location
- Cushions monitored for 45 min duration, some with 60 sec pressure reliefs every 15 minutes

**Everyday use testing**
- Attached logger and sensors inside cushion cover
- Logged data for approximately 1 week

Data Analysis

- Bout of sitting: threshold set at 10 minutes
- Steady-state: initially defined as <1/2°C/30 min

Results

**Skin and Cushion Temperatures**

- Temperature: Rohe vs. 2" HR70 foam vs. Silicone foam vs. Exact cushion

**Skin and Cushion RH**

- Relative humidity: Rohe vs. 2" HR70 foam vs. Silicone foam vs. Exact cushion

Conclusions

- Correlation between skin and cushion measurements:
  - Temperature: \( R > 0.9 \)
  - Relative Humidity: \( R < 0.4 \)
- Cushion-mounted sensors suitable for temperature, but not relative humidity measures
- Difference in skin and cushion temperatures after 45 minutes:
  - Rohe: 0.3°C
  - 2" HR70 foam: 0°C
  - Silicone foam: -1.1°C
  - Exact cushion: 1.5°C
- Movement is a good way to dissipate heat and alter shear and normal loading; can be facilitated through education, positive reinforcement
- Controlled tests did not reach steady-state, while most real-world bouts reached steady-state after approx. 90 minutes

Future Work

- Increase sample size to increase reliability of results
- Use subject debriefing to better contextualize data
- Inform modifications to current standardized heat & humidity test method
- Compare results of human and lab tests to assess validity

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