*Data article*

**Title:***Predicted percentage dissatisfied with ankle draft*

**Authors:** Shichao Liu1\*, Stefano Schiavon1, Alan Kabanshi2, William Nazaroff3

**Affiliations:**

1 Center for the Built Environment, University of California, Berkeley, CA, USA

2 Department of Building, Energy and Environmental Engineering, University of Gävle, Gävle, Sweden

3 Department of Civil and Environmental Engineering, University of California, Berkeley, CA, USA

**Contact email:** sliu8@wpi.edu

**Abstract**

We collected subjective responses on thermal comfort from 110 college students when their lower legs and ankles were exposed to air at different environment conditions (e.g., air speed and temperature). A draft risk model was developed based on the laboratory results. One can find more description in our original papers[1,2].

**Specifications Table** *[please fill in right-hand column of the table below]*

|  |  |
| --- | --- |
| Subject area | *Building and environment, engineering* |
| More specific subject area | *thermal comfort, ankle draft risk* |
| Type of data | *Table* |
| How data was acquired | *Direct measurement of air conditions and subjective survey responses from subjects* |
| Data format | *Raw data* |
| Experimental factors | *Air speed, air temperature* |
| Experimental features | *Air speed, air temperature* |
| Data source location | *US, Berkeley* |
| Data accessibility | *Data is also available on Dataone* https://doi.org/10.15146/R3S68S |

**Value of the data**

1. *Understand draft risk at ankles as a function of whole-body thermal comfort*
2. *Help develop an ankle draft risk model*
3. *Support indoor environmental design with displacement ventilation and underfloor air distribution systems.*

**Data variable description:**

* **Date:** Experimental date (xx/xx/xxxx)
* **Time:** Experimental time (format in 24 hours)
* **Seat:** Desk number during the experiment (3 desks in parallel)
* **Q\_name:** The name of questions in the survey
* **Vote:** voted data (numerical) from subjects, range from -3 to 3 for most questions.
* **Seq:** Two consecutive sessions: *adapt* and *test*
* **Tsp:** Air temperature near ankles (°C)
* **Thead:** Air temperature at the head level (°C)
* **Vsp:** Air speed near ankles (m/s)
* **Tisp:** Air turbulence intensity near ankles
* **SubID:** ID number of each subject
* **Sex:** Male and Female
* **Age:** (#)
* **Weight:** (Kg)
* **Height:** (m)
* **BMI:** (Kg/m2)
* **Berstay.sixm:** Months (#) of each subject stayed at Berkeley before the test.
* **ColdSens:** Sensitivity to the thermal environment: continuous scale 0 (Much lower sensitivity) to 5 (to Much higher sensitivity); *Question: please indicate how sensitive you think you are to thermal conditions.*
* **ColdExp:** Cold extremity experience: continuous scale 0 (Never) to 5 (Always); *Question: Have you suffered from cold hands or feet during the past two months?*
* **Workhr:** Hours of working out per week
* **Coffeeintake:** Cups (8 oz) of coffee intake
* **Dress:** Long trousers or sport shorts

**Data units**

* **Temperature:** ˚C
* **Air speed:** m/s

**Experimental Design, Materials and Methods**

***Subjects***

We hired a large number of subjects for this study. The subjects in first phase were 30 female college students[2]. In the second phase, 28 female and 52 male college students participated. The subjects were compensated for participating in the experiments. The UC Berkeley Committee for Protection of Human Subjects approved (CPHS #2010‐04‐1312) the research protocol, and all subjects signed an informed consent form before the tests. The anthropometric data of all the 110 subjects are summarized in Table 2. All the subjects were non‐smokers.

## *Surveys*

**T**he full survey questionnaire comprises six parts: (1) Overall thermal acceptability [clearly acceptable, just acceptable, just unacceptable, clearly unacceptable]; (2) Thermal comfort [very comfortable, comfortable, just comfortable, just uncomfortable, uncomfortable, very uncomfortable], thermal preference [warmer, no change, cooler], and thermal sensation, using a 7-point ASHRAE scale; (3) Air movement acceptability at the ankles [clearly acceptable; just acceptable; just unacceptable; clearly unacceptable], and thermal preference at the ankles [warmer, no change, cooler]; (4) Thermal sensation for each of the following body parts: hands, torso, ankles and feet; (5) Air movement acceptability for each of the following body parts: hands, torso, ankles and feet; and (6) Air quality acceptability. The full questionnaire is shown in the online Supporting Information.

The ASHRAE seven-point scale varies between cold and hot, as follows: cold (−3), cool (−2), slightly cool (−1), neutral (0), slightly warm (1), warm (2), hot (3). For this scale, subjects record their condition on a continuous scale. For acceptability, the subject marked their response on a continuous scale from clearly acceptable (+1) to just acceptable (+0.1) and from just unacceptable (−0.1) to clearly unacceptable (−1). In this scale, subjects are compelled to distinguish clearly between acceptable and unacceptable. A subject was considered to be dissatisfied because of draft when she reported uncomfortable air movement. The subjects assessed perceived air quality on the same acceptability scale. A subject was deemed to be dissatisfied with the air quality if she assessed the air quality as unacceptable.

## *Procedure*

Each 2‐hour test was split into six twenty‐minute sessions comprising three adaptation sessions and three test sessions. The first‐phase study suggested that thermal steady state was achieved within 5 minutes for the tested conditions. In addition, the procedure was designed to encourage subjects to start tests with a neutral whole‐body thermal sensation.

Figure 1(A) illustrates the test schedule of each laboratory visit. Subjects were split into two groups. Each subject began the test by sitting in the adaptation zone (at the back of the test room) for 20 minutes to adapt so as to start the test in a neutral thermal condition. The first group of subjects (Group I) was then guided to sit at the three workstations for 20 minutes, maintaining their feet flat on the floor within a prescribed region. Group I subjects were then returned to the adaptation zone for another 20 minutes. The subjects of Group II followed the same schedule, starting 20 minutes later than Group I. The two groups alternated between adaptation and test sessions until all six intervals were completed for both groups.

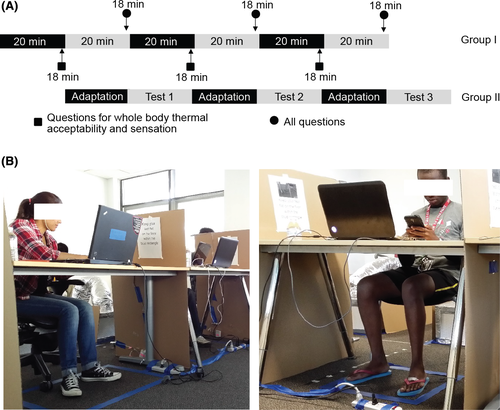


Figure 1. Experimental procedure and clothing conditions; (A) Test procedure of the two groups of subjects for each laboratory visit; (B) Clothing conditions for lower legs covered and uncovered in the experiments. Clothing adjustment for upper‐body parts was encouraged to maintain whole‐body thermal neutrality during the test. Subjects had to keep their feet on the floor within the blue area

Prior to participating in the experiment, subjects attended a training session to become familiar with the test room, procedure, and survey questions. We instructed the subjects to have enough sleep and to eat normal meals before arrival at the laboratory. Drugs and alcohol use were to be avoided during the 24 hour prior to the experiment. We also asked subjects to avoid intensive exercise during the last hour before each experiment. All subjects reported that they were in good health. We offered them the opportunity to reschedule their laboratory visits if needed, which provided them flexibility and reduced the likelihood of subjects participating while unwell. On average, each subject participated in six test conditions.

During the experiment, we instructed the subjects to be dressed in typical summer office clothes, either with lower legs uncovered or covered. For the uncovered condition, the subjects had bare lower legs, such as walking shorts (0.08 clo), and sandals (“flip‐flop” style) (0.02 clo) without socks. In the second test condition, where their lower legs were covered, the subjects wore long thin trousers/jeans (0.15 clo), flat shoes (0.02 clo), and socks (0.02 clo) to completely cover their lower legs, ankles, and feet. During the experiments, subjects were reminded to maintain whole‐body thermal neutrality by adjusting their upper‐body clothing (e.g., through use of a light jacket or long‐sleeve shirt). From observations made during these experiments, the estimated clothing insulation based on the CBE online comfort tool was in the range of 0.3‐0.7 clo, depending on experimental conditions. We did not record or measure clothing insulation during tests, as subjects were allowed to adjust their upper‐body clothing. However, the average difference in clothing insulation at the lower body for the two conditions was only 0.09 clo, based on CBE online comfort tool.25 We assigned one laptop computer to each workstation, and the subjects were allowed to read or type at the laptop; that activity corresponds to a metabolic equivalent value of 1.1‐1.2 met according to ANSI/ASHRAE Standard 55[3]. More details about the experimental procedure can be found in Schiavon et al.[2]

**Acknowledgements**

This research is funded by the Republic of Singapore's National Research Foundation through a grant to the Berkeley Education Alliance for Research in Singapore (BEARS) for the Singapore‐Berkeley Building Efficiency and Sustainability in the Tropics (SinBerBEST) Program. BEARS has been established by the University of California, Berkeley as a center for intellectual excellence in research and education in Singapore.

**References**

[1] S. Liu, S. Schiavon, A. Kabanshi, W.W. Nazaroff, Predicted percentage dissatisfied with ankle draft, Indoor Air. 27 (2017) 852–862.

[2] S. Schiavon, D. Rim, W. Pasut, W.W. Nazaroff, Sensation of draft at uncovered ankles for women exposed to displacement ventilation and underfloor air distribution systems, Build. Environ. 96 (2016) 228–236.

[3] ANSI/ASHRAE, Standard 55-2017, Thermal environmental conditions for human occupancy, (2017).