

Problem Statement & Research Context

- Heat can have an adverse effect on health, especially for individuals with pre-existing chronic diseases (Kovats & Hajat 2008).
- These conditions include heart or lung disease, obesity, or previous heat stroke (Mayo Clinic 2014).
- A poor heat regulatory system is also a factor in heat-health risk (Kovats & Hajat 2008).
- Under extreme heat conditions, an individual's health status may alter their experience with temperature, especially if they are already at risk of heat illness. For example, an at-risk individual may employ extra effort to avoid heat exposure through adaptive behaviors such as only spending time outside during the coolest parts of the day or hydrating themselves frequently.
- This study explores how individuals with different health statuses experience heat in Phoenix, Arizona.

Methods

- We recruited participants from five study neighborhoods in greater Phoenix to carry ThermoChron iButton air temperature sensors that measured their Individually Experienced Temperatures (IETs) for a one-week period in September, 2014 (Kuras et al. 2015).
- We paired participants that self-evaluated their health compared to their peers as "fair" or "poor" health (hereafter the "low health group") with participants that evaluated themselves as in "good" or "excellent" health (hereafter the "high health group") while controlling for relative age, race, gender, and neighborhood of residence.
- This pairing controlled for basic physiological differences as well as any environmental risk factors and attributes that may be unique to each neighborhood.
- We compared the groups in terms of average IET and thermal comfort during all hours, daytime hours (12PM-6PM), and nighttime hours (12AM-6AM).

Bibliography

- "Heatstroke." Heatstroke Risk Factors. Mayo Clinic, 2014. Web. 01 Dec. 2014.
- Kovats SR, Hajat S. Heat Stress and Public Health: A Critical Review. 2008 Annual Review of Public Health 29:41–55
- Kuras ER, Hondula DM, Brown-Saracino J (2015) Heterogeneity in Individually Experienced Temperatures (IETs) within an Urban Neighborhood: Insights from a New Approach to Measuring Heat Exposure. Int J Biometeorol. doi: 10.1007/s00484-014-0946-x

Results

- The high health group measured higher average IETs during the study week compared to the low health group, with more pronounced differences during the daytime (Figure 1, Table 1).
- In our sample, there was not enough data to suggest that healthier people felt more or less comfortable under similar temperature conditions. However, there were a few cases suggesting that the high health group felt more comfortable in the same temperatures than the low health group (Figure 2, Table 2-3)

Figure 1. Average all hours IETs of participants. Black lines are error bars. Blue bars are participants in the low health group and orange bars and participants in the high health group.

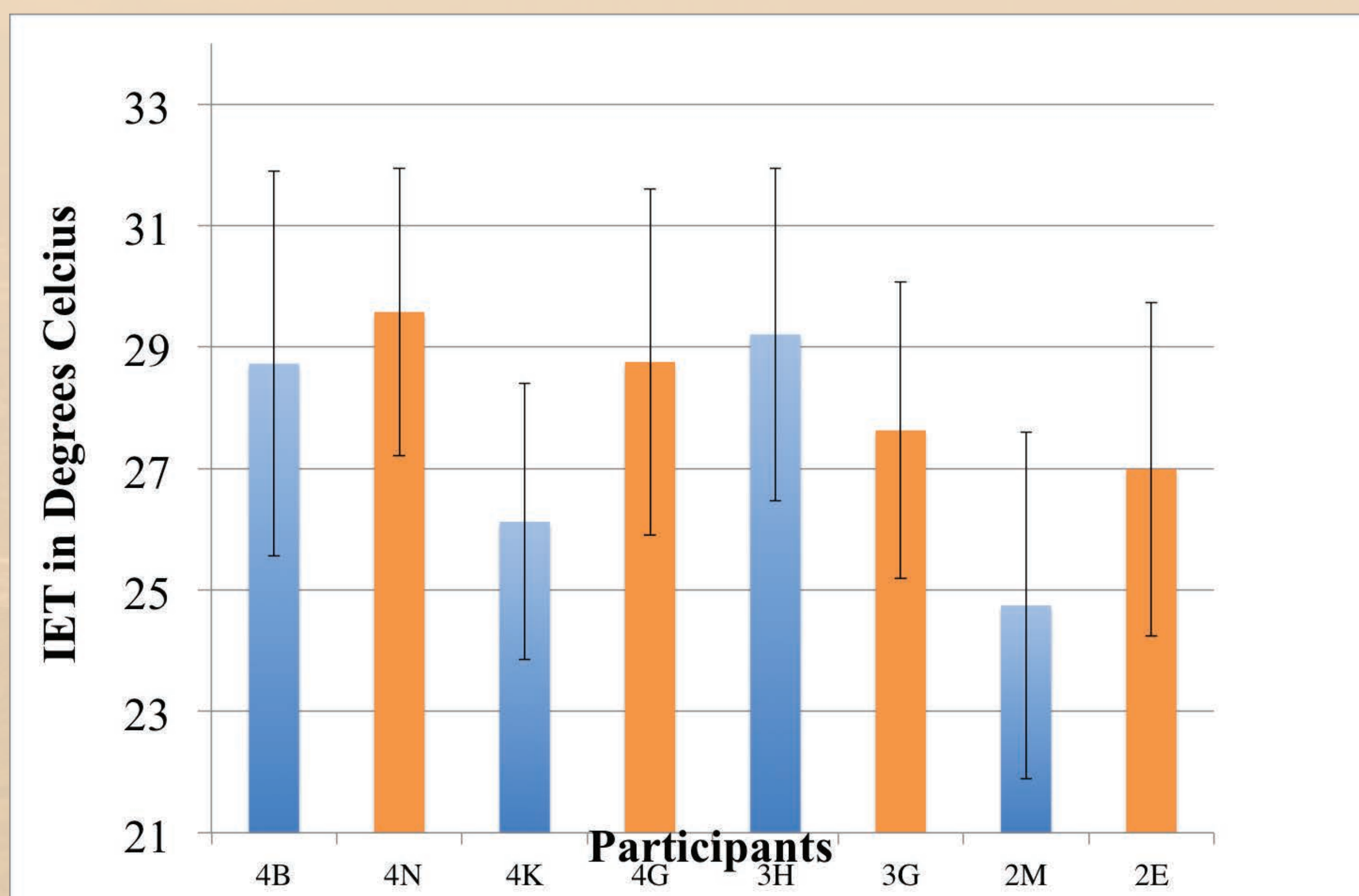


Table 1. Comparisons on IETs during all hours, daytime, and nighttime periods. The statistical test row shows resulting p-values

Participants	4B	4N	4K	4G	3H	3G	2M	2E
Total Avg. IETs (°C)	28.73	29.58	26.12	28.75	29.21	27.63	24.75	26.99
Statistical test	<.05		<.0001		<.0001		<.0001	
Std. Deviation	3.17	2.37	2.27	2.85	2.74	2.44	2.86	2.75
Day Avg. IETs (°C)	30.05	30.66	27.03	31.01	31.36	27.96	26.02	28.40
Statistical Test	<.05		<.0001		3.77E-14		9.67E-13	
Std. Deviation	2.83	2.02	2.76	2.45	2.75	3.43	3.45	2.33
Night average IETs (°C)	28.03	27.98	25.20	26.18	26.89	26.56	23.03	24.59
Statistical test	>.1		<.0001		<.001		<.0001	
Std. Deviation	3.265	0.754	1.373	0.727	0.947	0.571	0.506	0.301

Table 2-3. These tables highlight moments when the high health participant (4N) and the low health participant (4B) measured similar IETs and reported widely different thermal comfort levels. In the first table, during the night hours, the two experienced similar temperatures, but the low health participant felt warmer and was significantly less comfortable. In the second table, during the day hours, the two experienced similar IETs and the low health participant felt significantly less comfortable.

Participant	Health Status	Day of Week	Night Temp	Night Comfort	IET Night (°C)
4N	High	Monday	Slightly Cool	Very Comfortable	27.6
4B	Low	Monday	Warm	Uncomfortable	26.4

Participant	Health Status	Day of Week	Outside Temp	Comfort	IET Day (°C)
4N	High	Monday	Warm	Comfortable	31.3
4B	Low	Monday	Hot	Uncomfortable	31.9

Conclusion

- We found that the low health group experienced significantly lower IETs compared to the high health group.
- A limitation of our study is that participants were not asked specifically about their health status in terms of pre-existing conditions known to exacerbate heat-health risk.
- Future studies should examine a larger sample size with more control for health-status.
- By understanding the relationship between health status, thermal comfort, and heat exposure we can help prevent against heat related illness.

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