The Effect of Indoor Air Quality on Sleep Quality

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Objectives

Develop an all-in-one indoor air quality (IAQ) monitoring device with affordable, consumer-grade sensors

Develop calibration protocol for IAQ sensors

Determine the extent IAQ parameters affect sleep quality

Improve from previous studies:
- Collect data over longer periods
- Measure more IAQ parameters
- Use *objective* and *subjective* measures of sleep quality
- Monitor bedrooms in the field

Results

IAQ Parameter	Sleep Quality Metrics	
	Self-Report	Fitbit
↑ TVOC	–	↑ TST, ↑REM:nREM
↑ CO	↑ NAW	↓ TST, ↓ SE
↑ CO_2	↓ restful, ↓ SOL	↓ TST
↑ $PM_{2.5}$	↑ restful, ↓ NAW	↑ SE, ↓REM:nREM
↑ T	↓ TST, ↓ NAW, ↓ SOL	↓ TST

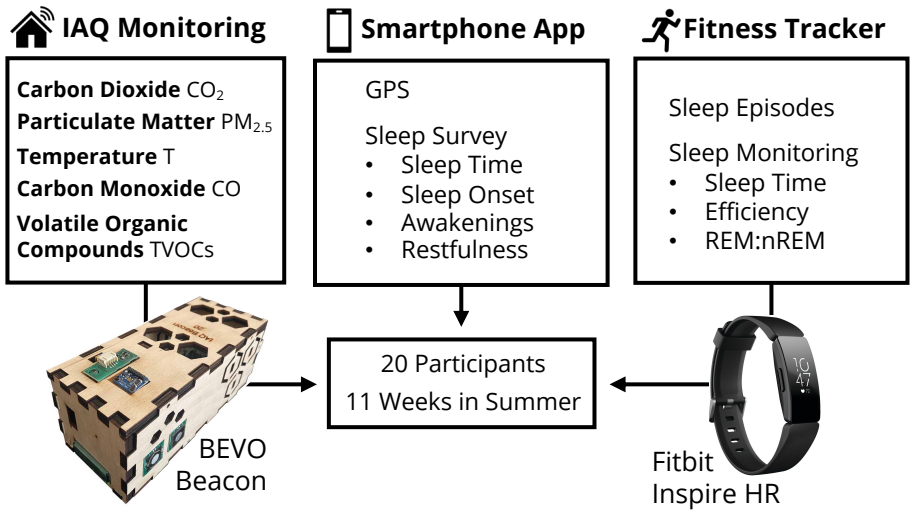
TST: Total Sleep Time
NAW: Awakenings
SOL: Sleep Latency
SE: Sleep Efficiency
REM: Rapid-Eye-Movement

Elevated TVOCs and $PM_{2.5}$ associated with **improved** sleep quality

Elevated CO, CO_2, and T associated with **degraded** sleep quality

Elevated TVOCs and $PM_{2.5}$ altered sleep staging

Approach



Impact / Future Work

Proper ventilation/IAQ important for good night's sleep

First study of its kind to report on the relationship between CO/TVOCs and sleep quality

Relationship of sleep quality with aggregate measures – TVOCs and PM – are more complex and will depend on the subspecies

Need to conduct same study in more polluted environment

↓IAQ, ↓Worse Sleep – might not be linear

Testing in vulnerable Austin community