



Rethinking comfort within human-building resilience*

Marcel Schweiker

Webinar – Dumb buildings with smart users? Linking building performance & human well being

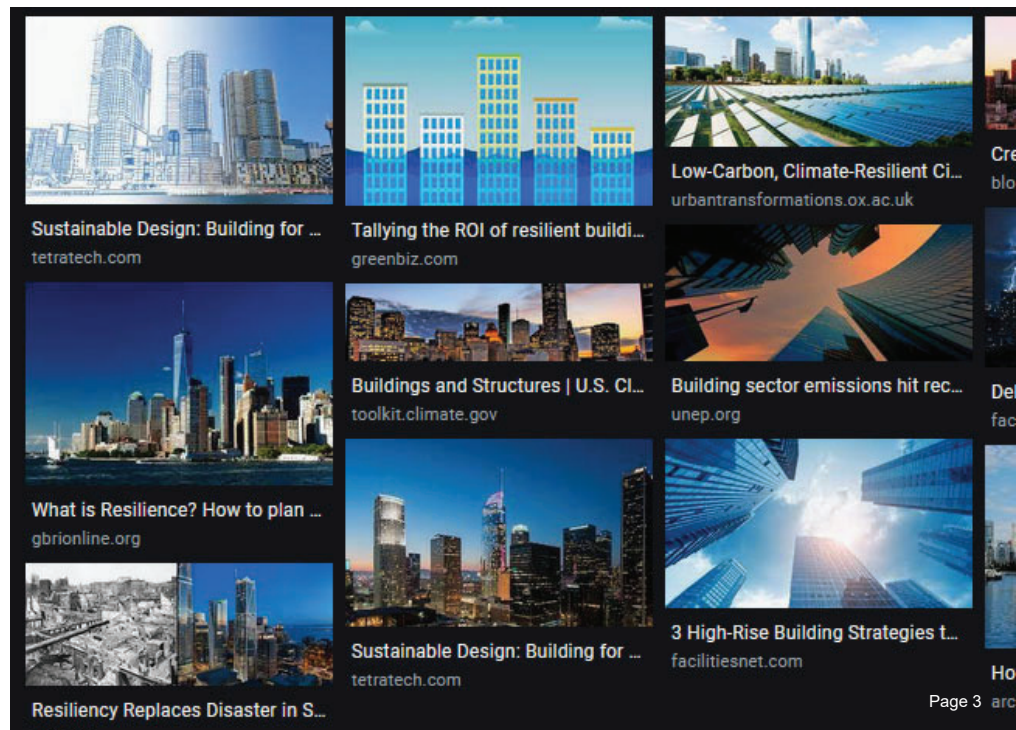
15 November 2022

* Schweiker (2022). Rethinking resilient thermal comfort within the context of human-building resilience.
In: Nicol et al., **Routledge Handbook of Resilient Thermal Comfort**

Rethinking resilience

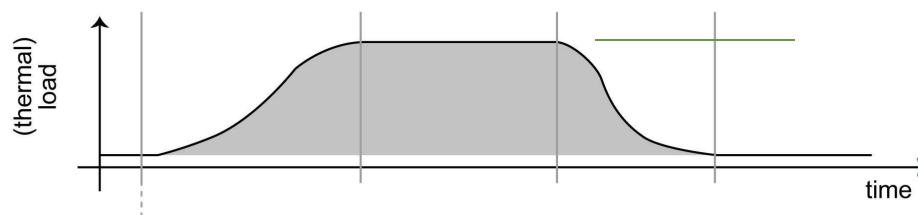
Resilience

- Resilient buildings



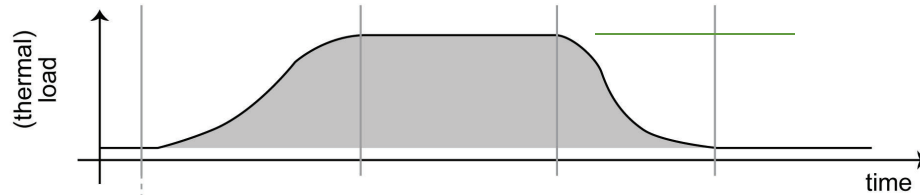
Uniklinik RWTH Aachen

All starts with a challenge...



Building resilience

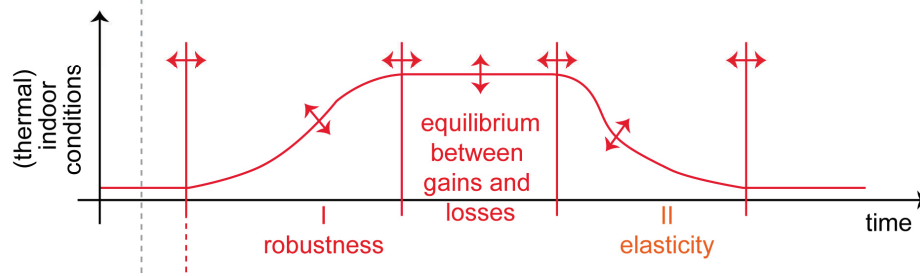
a) challenge



b) building resilience

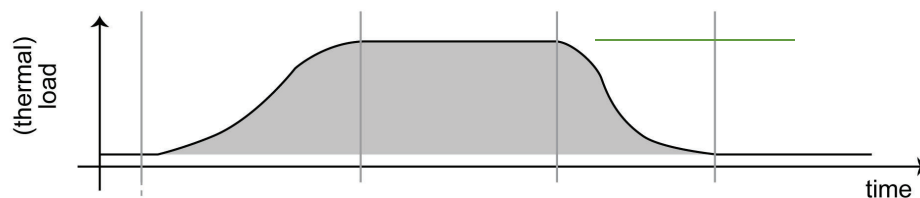


building characteristics (thermal mass, shading, openings, HVAC, IEQ controls, ...)



Building resilience – the case of active cooling

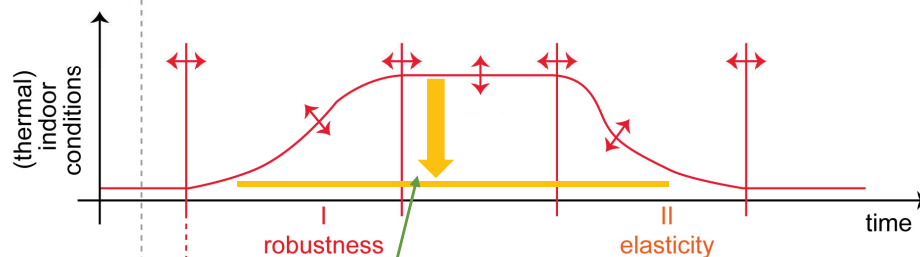
a) challenge



b) building resilience

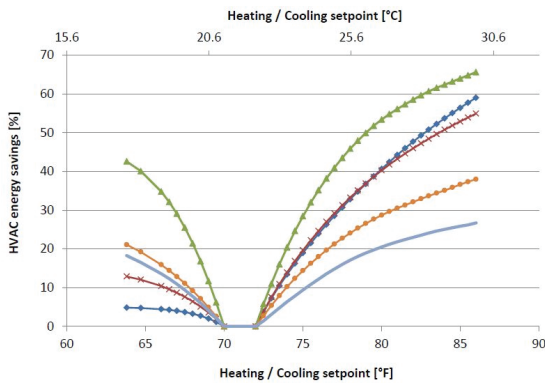


building characteristics (thermal mass, shading, openings, HVAC, IEQ controls, ...)



max. relief = max. resilience? = max. WB&H?

Misunderstood building resilience



The New York Times

A New, Deadly Risk for Cities in Summer: Power Failures During Heat Waves

The author of a new study said the combination of blackouts and extreme heat “may be the deadliest climate-related event we can imagine.”

Uniklinik RWTH Aachen | Hoyt et al. 2014 Extending air temperature setpoints | Photo by [Douglas LeMoine](https://www.nytimes.com/2021/05/03/climate/heat-climate-health-risks.html)/CC BY-ND 2.0 | <https://www.nytimes.com/2021/05/03/climate/heat-climate-health-risks.html>

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Relief is nice



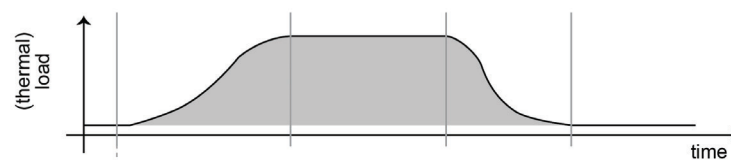
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Relief is nice, but...

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Notes:
							
							
							
							
							

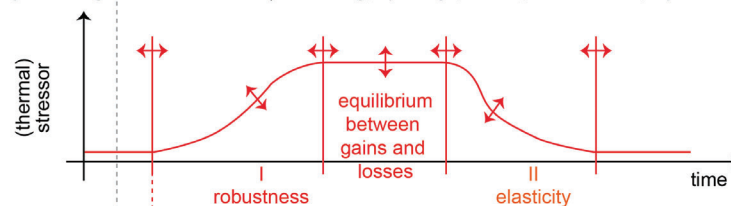
Adding the human dimension

a) challenge



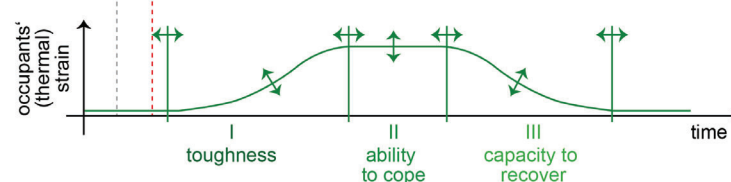
b) building resilience

↕ building characteristics (thermal mass, shading, openings, HVAC, IEQ controls, ...)



c) human resilience

↕ personal characteristics (physiology, behaviour, adaptation level, perceived control, personality, ...)



Rethinking comfort

Thermal comfort

- How do you feel right now?

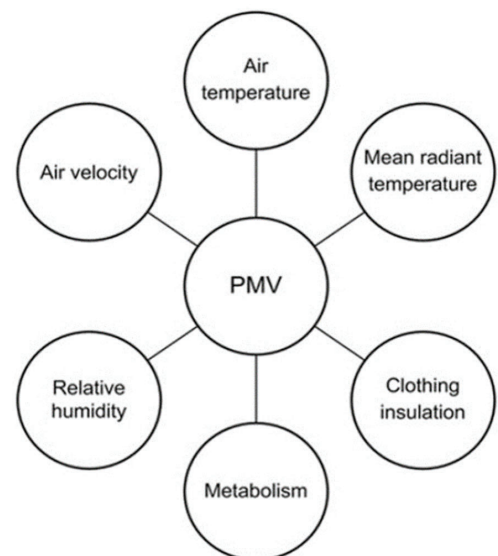
- Hot
- Warm
- Slightly warm
- Neither nor
- Slightly cool
- Cool
- Cold



Comfort/
Neutrality

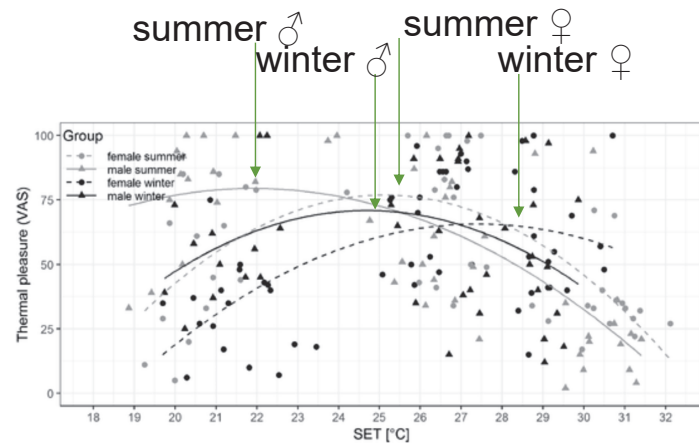
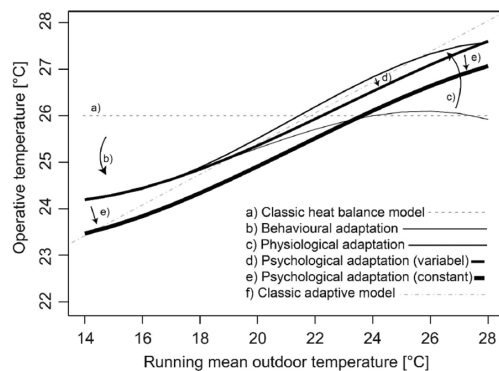


Well-being/
health/
resilience



Rethinking comfort

- (not only) relief, (the neutrality approach)
- (but also) encouragement (adaptation), and
- enjoyment (alliesthesia)

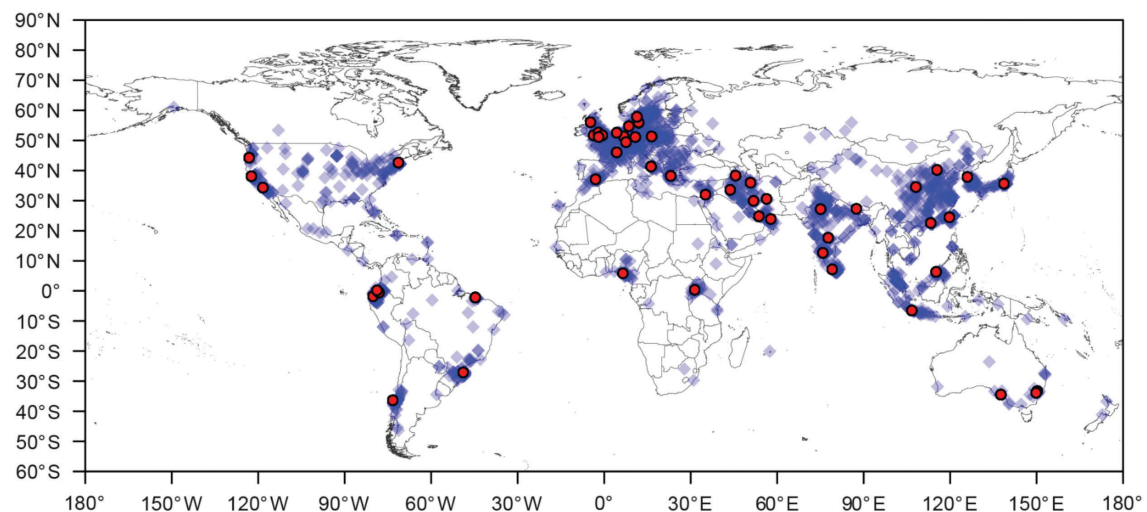


Uniklinik RWTH Aachen | Schweiker and Wagner (2015) <https://doi.org/10.1016/j.buildenv.2015.08.018> | Schweiker et al. (2020) <https://doi.org/10.1016/j.enbuild.2019.109745> | Schweiker (2022) <https://doi.org/10.1111/ina.13018>

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LuF Healthy Living Spaces, Institut für Arbeits-, Sozial- und Umweltmedizin

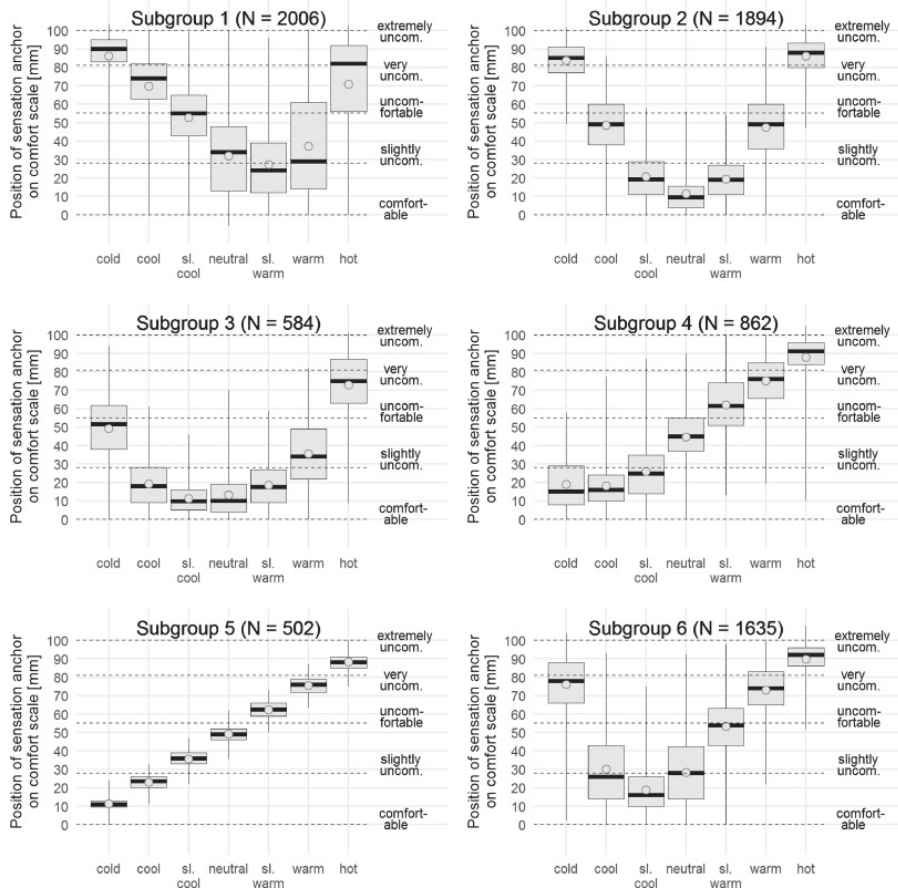
Perception vs. evaluation – the Scales study



N= 90+ Reserchers | 20+ language versions
8225 data sets from 59 cities in 32 countries

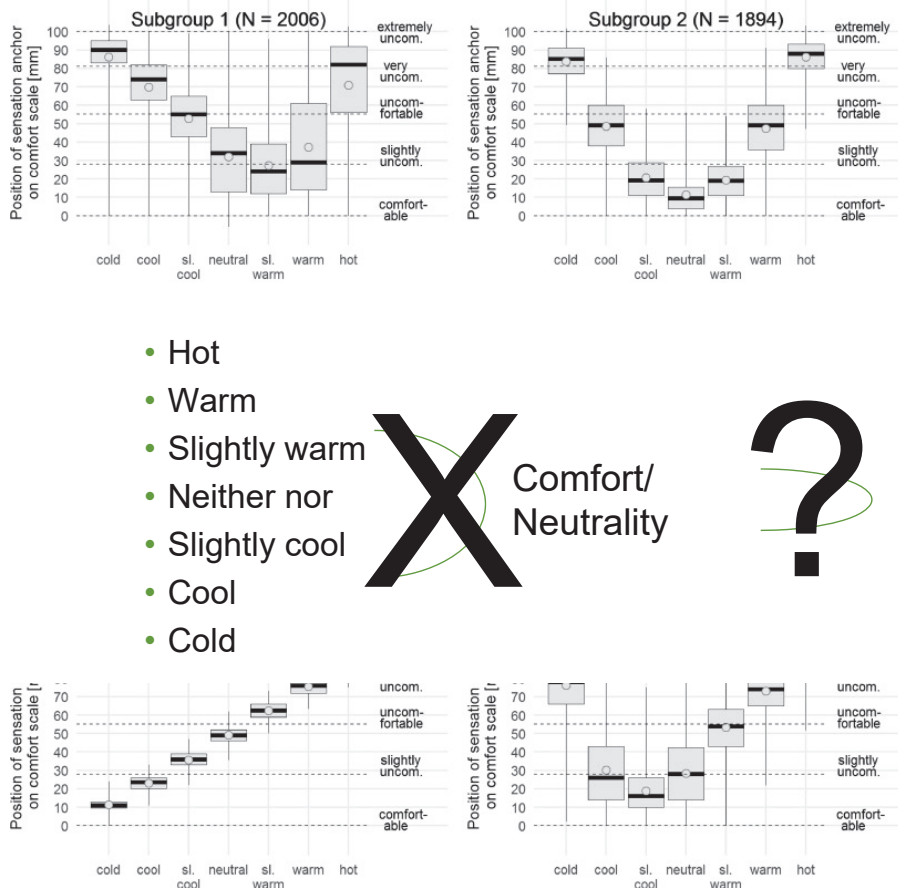
Uniklinik RWTH Aachen | Schweiker et al. 2019 <https://doi.org/10.1038/s41597-019-0272-6> | Schweiker et al. 2020 <https://doi.org/10.1016/j.enbuild.2020.109761>

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Uniklinik RWTH Aachen | Schweiker et al. 2019 <https://doi.org/10.1038/s41597-019-0272-6> |
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Comfort/
Neutrality



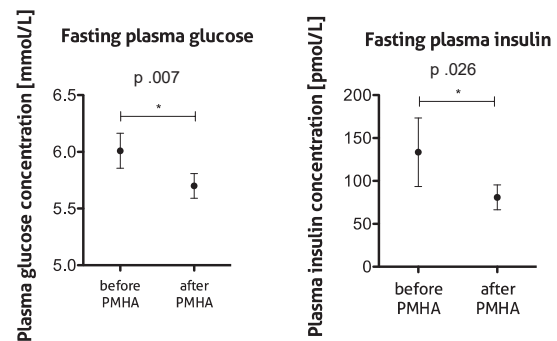
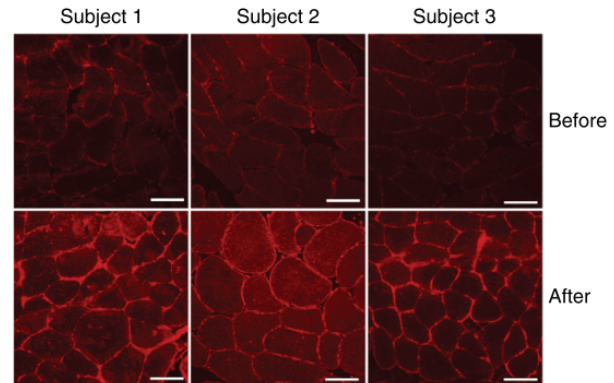
Well-being/
health/ resilience

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Discomfort and health

- Cold exposure increases insulin sensitivity in patients with type 2 diabetes mellitus (Hanssen et al. (2015).
- Passive mild heat exposure lowers fasting glucose, insulin, mean arterial blood pressure (Pallubinsky et al. 2020)

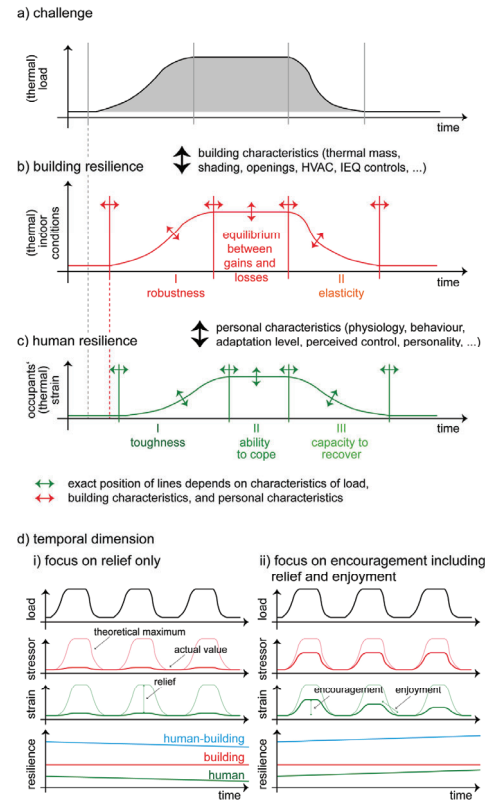


Uniklinik RWTH Aachen | Hanssen et al. 2015 | Pallubinsky et al. 2020

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Rethinking human-building resilience

Human-building resilience framework



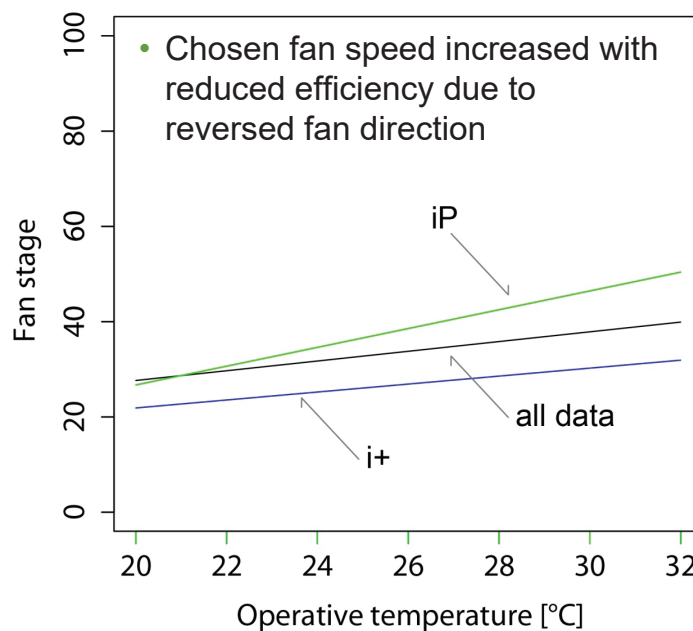
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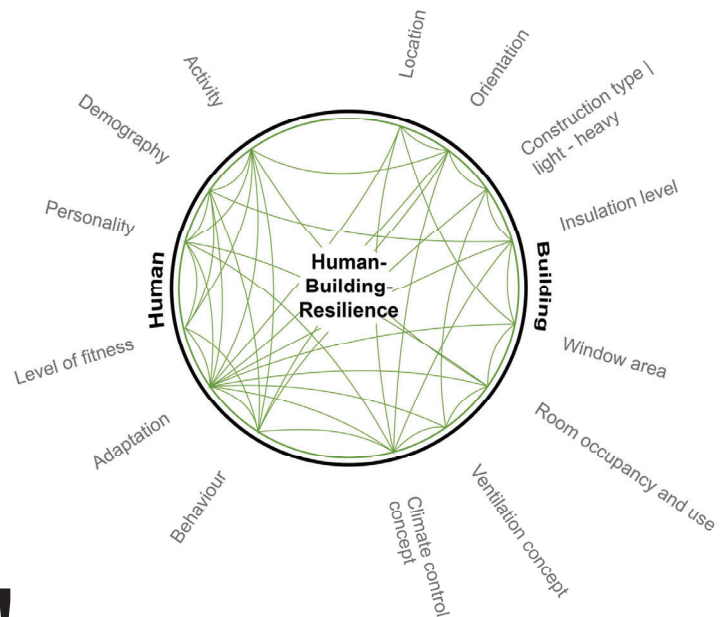
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The intelligent occupant

Subconsciously ...

... and sometimes surprising





Thank you for your attention!

Any questions?

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