Exploring a sustainable building's impact on occupant mental health and cognitive function in a virtual environment

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Research Goals:

The researchers aimed to develop, test, and validate a data-driven neuroscience to assess the impacts of sustainable design features on occupant stress, behaviors, and attitudes.

Hypotheses:

1. Compared to CBs, occupants will respond to SBs with higher engagement, particularly to the sustainable visual stimuli; hence, SBs are associated with increased visual system engagement compared to CBs
2. Compared to CBs, occupants of SBs will exhibit modulated attentional focus and control processing

Theoretical Framework:

- Event Related Potential (ERP): measures neural response to visual stimuli
- Cognitive Architecture Theory (CA): demonstrates how specific environments influence mental states
- Cognitive Load Theory (CLT): framework to understand stimuli as either instrinsic or external loads

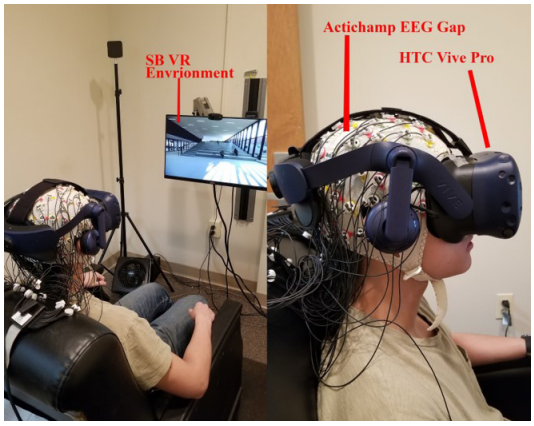
Method of Analysis:

Subjects wore an EEG cap with 104 electrodes and viewed two architectural environments in virtual reality: SB, with open spaces and access to daylight and views, and CB, with compartmentalized spaces and artificial lighting.

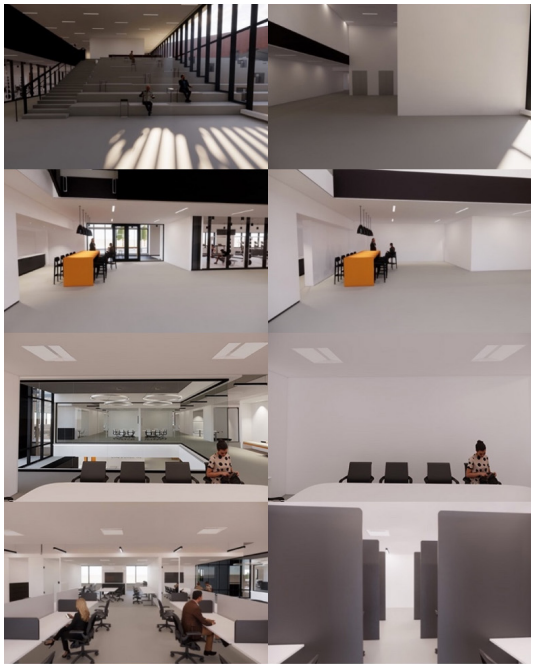
Conclusions & Discussion:

Views, light, and spatial arrangements in the SB elicited higher delta/theta activity, which supports both hypotheses based on the proposed Cognitive Load Theory.

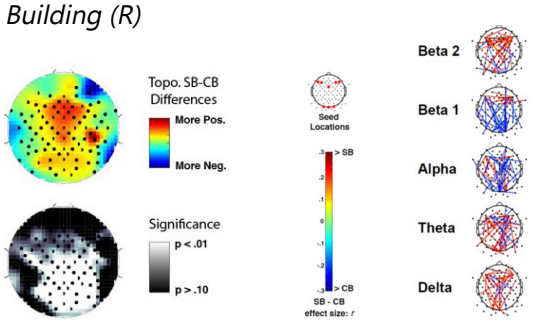
This effort is part of an ongoing effort to understand the relationship between the built environment and neurospychology.



VR and EEG cap on a subject



Sustainable Building (L) vs. Conventional Building (R)



Subjects had higher theta/delta activity while viewing the SB movie (red) compared to the CB movie (blue)

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