# Environment and Health

## Global/local challenges and actions


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TRACK 40

# Simulation as Assessment

## Utilizing Eye Tracking in VR Environments to Understand the Impact of Biophilic Interventions

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The contribution of biophilic elements to stress reduction and the mental well-being of occupants has been known for many decades, the basis of which was argued to be the inherent accord between humans and nature due to evolutionary exposure. It is no accident that the prominent rating systems and building standards such as LEED, WELL, and Living Building Challenge reference the positive impact of biophilic elements in the built environment. Up until recently, the understanding of emotional response to architecture has been about subjective experiences and intuitions (Eberhard, 2009). Recent developments in biometric data collection tools created an opportunity to develop a more robust understanding of the emotional impact of architecture (Kim & Kim, 2022). This is one step further than typical observations, post-occupancy evaluations, and self-reported assessments of spatial features and dynamics, which are known to introduce substantial bias. A substantial portion of eye tracking research involves tracking eye movements while the subject is looking at static images, watching a video on a screen, or exploring 360o pseudo-VR environments. Compared to VR, such implementations lack the contribution of stereopsis, parallax effect, and vestibular feedback, substantially hindering the sense of presence, and immersion (Guler, 2022). The limited research on the emotional impact of biophilic interventions in interior spaces, coupled with the already severely limited research incorporating eye-tracking present a significant gap in the literature. In accordance with Kaplan's Attention Restoration Theory (ART) and Ulrich's Stress Reduction Theory (SRT), this research aims to investigate the emotional impact of biophilic interventions in public interior spaces by focusing on eye-tracking data: gaze fixations, fixation durations, and scan paths, as well as heart rate variability and galvanic skin response data. To collect this data and visualize it, a bespoke software system is developed with Unreal Engine. A photorealistic office building atrium is modeled to be used as the virtual experiment environment. Aside from the control condition – participants' biometric responses to 4 different spatial variations are observed: biophilic elements, natural views, color-mimicking biophilic elements, and natural materials. Convenience sampling is utilized to create a pool of interior architecture and architecture students (n=60+, data collection ongoing), due to their intrinsic interest in spatial characteristics. Each participant experiences the same virtual environments, in randomized order. One-way ANOVA and t-test comparisons with calculated effect sizes will be used to analyze the biometric data collected via the control condition and 4 spatial variations. This research will help designers and researchers better understand the emotional response to biophilic interventions in interior environments, in addition to showcasing a methodology for collecting, visualizing, and interpreting eye-tracking data of a 3D environment.

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