

Abstract for presentation as part of the symposium: “Research from the Restorative Environments network: Restorative environments (I)”

ICEP2023

Title

The psychophysiological reactivity to beaches, green, and urban environments: insights from a virtual reality experiment

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Abstract

Coastal environments effectively reduce perceived levels of stress. However, little is known about whether coastal environments influence physiological parameters of stress differently than green and urban environments. The current study exposed 164 participants (18-65y, 68% female) from the Flemish population to two 16-minute virtual reality exposures (i.e. beach vs. green or urban) via a randomized cross-over design, during which the heart rate, high-frequency heart rate variability (HF-HRV), skin conductance response (SCR), mean arterial pressure (MAP), breathing rate, and upper trapezius muscle tone were monitored. Self-reported measures of stress were also taken. General linear mixed models analyzed for each parameter whether the change over time differed per exposed environment and by the

level of stress in the past week (from 'low' to 'mild' levels). Results show that beaches caused lower SCR than green environments and lower breathing rates compared to the urban exposure. The individuals' level of stress in the past week did not affect these effect sizes. The upper trapezius muscle tone showed complex patterns, and the heart rate, HF-HRV, and MAP did not react differently to the beach than to the green and urban environments. The results mark the importance of considering physiological parameters of diverse stress-related pathways and the individuals' state stress. This study demonstrates that beaches reduce the sympathetic nervous system activity and slow down breathing more than green and urban environments do. As such, it highlights the importance of beaches for health and wellbeing.