

Evidence for the benefits of coastal environments for human health: Insights from psychophysiological measurements

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The sea and coastal environments provide many opportunities to improve physical and mental health, and a key benefit that people tend to report after having visited a coastal environment is the reduction of stress. However, little remains known about whether exposure to coastal environments actually influences objective, psychophysiological parameters of stress differently than green and urban environments. Therefore, the current study exposed 164 adults (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 physiological biomarkers of stress (i.e. heart rate, high-frequency heart rate variability (HF-HRV), skin conductance response (SCR), mean arterial pressure (MAP), breathing rate, and upper trapezius muscle tone) and self-reported stress were measured. Each parameter was analysed with general linear mixed models to reveal whether the change over time differed per exposed environment and by the level of stress in the past week (from 'low' to 'mild' levels). The 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 or urban environments. The results demonstrate that coastal environments not only improve self-reported indices of health and wellbeing, but also objectively measured physical biomarkers of stress. Furthermore, this study illustrates that virtual reality can be a useful tool to standardize exposure to outdoor environments, perform valid psychophysiological measurements, and exclude the effects of physical activity otherwise found with real exposures.

Keywords

Ocean and Human Health; Stress; Psychophysiology; Virtual Reality; Beaches