Myth or fact: does a coastal walk reduce stress? A physiological study with wearable technology

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Chronic stress, identified by the World Health Organization as the "Health Epidemic of the 21st Century," significantly impacts human mental and physical well-being, putting substantial pressure on the health care system and increasing health care costs. Exposure to natural environments has been associated with positive health outcomes, including a reduction in physiological stress. A natural environment that has been deemed healthy for centuries is the coast. However, research on the physiological health effects of coastal exposure is sparse. Field studies on this topic are not often performed, although a real-life approach is a more environmentally valid method than studying people in a laboratory environment.

This study aimed to fill this knowledge gap by exploring the impact of an outdoor coastal walk on objective physiological parameters related to stress with innovative technologies. A randomized cross-over design was used, in which 15 participants (21-56 years, 53% female) walked in a coastal and an urban environment. During these walks, wearable technology (the NeXus-10 MKII) was used to continuously measure high-frequency heart rate variability (HF-HRV) as a proxy for the parasympathetic nervous system (PNS) activity. Self-reported mental health parameters and movement data were acquired as well. Linear mixed models were used to analyse HF-HRV and each self-reported parameter, while controlling for physical activity, weather conditions and the stress level of participants in the week prior to the experiments.

Results revealed a more pronounced reduction in PNS activity due to the coastal walk compared to the urban walk. Moreover, perceived stress levels decreased more due to the urban walk. Both of these results suggest a significantly higher stress-reducing effect of the urban walk. However, this was possibly influenced by participants' familiarity with the urban environment, which should be addressed in future research. Additionally, analysing distinct environmental components (e.g. the dunes for the coastal walk, the shopping streets for the urban walk), as opposed to a holistic method of studying the environments, proved crucial in understanding their varying physiological effects.

The initial hypothesis that the coastal walk would have a higher stress-reducing effect than the urban walk was rejected. The small sample size and relatively simple test design might be an explanation for these unexpected results. Despite these challenges, this study emerged as a pioneer in using the NeXus-10 MKII during an outdoor walk. As such, the results of this study not only provide essential methodological information regarding the constraints and applicability of this specific device, but also highlight the need for wearable technology designed for outdoor use and physical activity. Furthermore, while this study did not yield an univocal conclusion on the (mental) health effects of coastal exposure, this research provided some valuable insights by integrating diverse physiological, self-reported, and movement data.

Keywords
Oceans And Human Health; Stress; Physiology; Wearable Technology