

The Impact of Coastal Walking on Stress and Cognitive Function in Older Adults: A Field Experiment Using Wearable Technology

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With rising life expectancy, the prevalence of chronic health conditions such as cardiovascular disease and Alzheimer's disease is creating a significant healthcare burden. As healthcare systems face increasing pressures, innovative preventive strategies are essential. Exposure to natural environments has shown promise for reducing stress and improving cognitive function, outcomes that are particularly relevant for older adults. While the health benefits of green spaces are well-documented, the effects of coastal environments, with their unique sensory and atmospheric qualities, remain underexplored. Moreover, most studies focus on perceived health outcomes, rather than objective physiological measures, and older adults—who represent a significant part of Belgium's coastal population—are rarely the primary study group. Additionally, research often emphasizes passive exposure, overlooking the potential amplifying effects of physical activity on health outcomes.

This study investigates the physiological and cognitive effects of coastal walking in older adults using wearable technology. A randomized cross-over design was employed with 48 participants aged 60 and older completing two 30-minute walks, one in a coastal environment and one in an urban environment in Ostend, with a one-week interval between sessions. Each session included 15 minutes of seated exposure prior to walking. Continuous heart rate variability (HRV) and electrodermal activity (EDA) data were collected using the EmbracePlus wristband and the Polar H10 chest band, while saliva samples at four time points measured cortisol levels. Cognitive function was assessed pre- and post-exposure using the d2 Test of Attention and the Symbol Digit Modalities Test. Furthermore, self-reported mental health measures were collected.

A pilot study with 15 participants (ages 21–56, 53% female) was conducted to refine the methodology. Pilot results unexpectedly indicated that the urban walk reduced stress more effectively than the coastal walk, with greater reductions in perceived stress and a smaller decrease in high-frequency heart rate variability (HF-HRV) in the urban environment. Walking led to a reduction in perceived stress in both environments, supporting the benefits of active engagement with the environment. However, the greater stress reduction in the urban environment may have been influenced by a familiarity bias, as participants were more familiar with the urban setting. These findings led to adjustments in the current study design, including controlling for familiarity, increasing the sample size, and using more advanced wearable technology.

It is hypothesized that exposure to coastal natural environments will have stronger positive effects on physiological stress and cognitive function compared to urban environments in older adults. This research aims to contribute to the growing body of evidence on nature-based interventions and inform strategies for improving health outcomes in ageing populations.

Keywords

Coastal Environments; Older Adults; Wearable Technology; Physical Activity; Physiological Stress; Cognitive Function