

## The NeXus-10 MKII for holistic insights in the physiological drivers behind mental health restoration from virtual coastal landscapes

Hooyberg Alexander<sup>1,2</sup>

<sup>1</sup> Flanders Marine Institute (VLIZ), Wandelaarkaai 7, 8400 Oostende, Belgium

E-mail: [alexander.hooyberg@vliz.be](mailto:alexander.hooyberg@vliz.be)

<sup>2</sup> Department of Public Health and Primary Care, Ghent University, C. Heymanslaan 10, Entrance 42 - Floor 5, 9000 Gent, Belgium

Exposure to coastal environments has been shown to improve subjective and psychological indicators of human health and wellbeing. However, there is still very little known about coasts' impact on the physiological symptoms of relaxation. Therefore, the aim of this study was to investigate the changes in the physiological symptoms of relaxation, alongside those in mood and cognition, and in response to being exposed to beaches, and for comparison to beaches with litter, green spaces, and urban spaces. A randomized controlled cross-over experiment exposed each participant to two virtual-reality environments with sound: to beaches and to one of the other environments. The NeXus-10 MKII from MindMedia (acquired with the BMRI grant) was used to measure the physiological symptoms of relaxation (i.e. brain activity, cardiovascular functioning, respiration, muscle tension, skin conductance, temperature). This was complemented with the measures of perceived stress, perceived mental exhaustion, positive and negative mood, perceived restorativeness (via questionnaires) and of cognitive performance (i.e. Stroop, DSB). The participants were 164 healthy adults aged 18-65y, recruited via a media-campaign ([www.uitzicht.org](http://www.uitzicht.org)). A series of generalized linear mixed models investigated whether changes in the outcomes differed between the environments, while controlling for participant and study-design related covariates and random effects. The preliminary non-peer-reviewed results indicated that, compared to urban spaces, beaches positively influenced psychological outcomes (e.g. mood and restoration, not cognitive performance) and decreased brain activity and respiration rate. Compared to green spaces, beaches were associated with lower negative mood, better scores for attention inhibition, and lower brain activity. The presence of small representative amounts of litter resulted only in increased negative mood and a lower perceived restorativeness. In conclusion, this is the first study that measured the impact of coastal environments on a wide range of physiological symptoms of relaxation in combination with psychological measures. As such, it provides more detail about the widely-known perceived health benefits of coastal environments, which have remained largely under-investigated. Future efforts will be directed towards additional analyses on the acquired large dataset (e.g. moderation for participant's characteristics).

Keywords: Coast; Health; Virtual reality; Psychophysiology; Attention; Restoration