

Virtual natural environments and benefits to health

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A new position paper by researchers at the European Centre for the Environment and Human Health (ECEHH - part of the Peninsula College of Medicine and Dentistry) and the University of Birmingham has compared the benefits of interaction with actual and virtual natural environments and concluded that the development of accurate simulations are likely to be beneficial to those who cannot interact with nature because of infirmity or other limitations: but virtual worlds are not a substitute for the real thing.

The paper includes details of an exciting project underway between the collaborating institutions to create virtual environments to help identify the clues and cues that we pick up when we spend time in nature.

The study is published in *Environmental Science & Technology* on 1st June 2011.

The paper discusses the potential for natural and virtual environments in promoting improved human health and wellbeing.

We have all felt the benefit of spending time in natural environments, especially when we are feeling stressed or upset. The researchers describe creating virtual environments to try to identify just how this happens. It may be that the colours, sounds, and smells of nature are all important, but to different extents, in helping to provide mental restoration and motivation to be physically active.

It was recognised that, while some studies have tried to explore this notion, much of the work is anecdotal or involves small-scale studies which often lack appropriate controls or statistical robustness. However, the researchers do identify some studies, such as those relating to Attention Restoration Theory, that are valuable.

Key to the research is an exploration of the studies that showed a direct relationship between interaction with the natural environment and improvements in health, and the potential such activity has for becoming adopted by health services around the world to the benefit of both patients and budgets. For example, a study in Philadelphia suggested that maintaining city parks could achieve yearly savings of approximately \$69.4 million in health care costs.

Programmes such as the Green Gym and the Blue Gym which promote, facilitate and encourage activity in the natural environment, are already laying the groundwork for workable programmes that could be adopted throughout the world to the benefit of human health. Research teams from the ECEHH are currently undertaking a range of studies to analyse the effects of interaction with the natural environment on health which in turn could lead to prescribing clinicians being able to treat patients with natural environment activity alone or in conjunction with reduced pharmaceutical solutions – the beneficial effect on national health service drug bills around the world could be immense, and also help reduce the release of toxic pharmaceutical residues contained in sewage into our ecosystems.

The paper also examines how step-change developments in the technology used in computer-generated forms of reality means that the software and hardware required to access increasingly accurate simulated natural environments are more readily available to the general public than ever before.

In addition to recognising the value of better technology – which includes the ability to synthesise smells - the review also recognised that key to the success of virtual environments is the design of appropriate and effective content based on knowledge of human behaviour.

Teams from the ECEHH and colleagues from the University of Birmingham, which include joint authors of the paper, have constructed the first two virtual restorative environments to support their experimental studies. This pilot study is based on the South Devon Coastal Path and Burrator Reservoir located within Dartmoor National Park, both within a short distance of the urban conurbation of Plymouth (UK).

Both [natural environments](#) are being recreated using Unity, a powerful game and interactive media development tool.

The research team is attempting to achieve a close match between the virtual and the real by importing Digital Terrain Model (DTM) data and aerial photographs into the Unity toolkit and combining this with natural features and manmade artefacts including wild flowers, trees, hedgerows, fences, seating benches and buildings. High-quality digital oceanic, coastal and birdsong sounds are also incorporated.

The pilot study, part of a Virtual Restorative Environment Therapy (VRET) initiative, is also supporting efforts to establish how psychological and physiological measurement can be used as part of a real-time biofeedback system to link participants' arousal levels to features such as cloud cover, weather, wave strengths, ambient sounds and smells.

Professor Michael Depledge, Chair of Environment and [Human Health](#) at the ECEHH, commented: "Virtual environments could benefit the elderly or infirm within their homes or care units, and can be deployed

within defence medical establishments to benefit those with physical and psychological trauma following operations in conflict zones. Looking ahead, the wellbeing of others removed from nature, such as submariners and astronauts confined for several months in their crafts, might also be enhanced. Once our research has been conducted and the appropriate software written, artificial environments are likely to become readily affordable and of widespread use to health services."

He added: "However, we would not wish for the availability of virtual environments to become a substitute for the real thing in instances where accessibility to the real world is achievable. Our ongoing research with both the Green Gym and the Blue Gym initiatives aims to make these options a valid and straightforward choice for the majority of the population."

Professor Bob Stone, Chair of Interactive Multimedia Systems at the University of Birmingham, and lead investigator, said: "This technology could be made available to anyone who, for whatever reason, is in hospital, bed-bound or cannot get outside. They will be able to get the benefits of the countryside and seaside by viewing the virtual scenario on screen.

"Patients will be free to choose areas that they want to spend time in; they can take a walk along coastal footpaths, sit on a beach, listen to the waves and birdsong, watch the sun go down and - in due course - even experience the smells of the land- and seascapes almost as if they were experiencing the outdoors for real."

Professor Stone continued: "We are keen to understand what effect our virtual environments have on patients and will be carrying out further studies into arousal levels and reaction. In the summer we will start to test this on a large number of people so that we can measure biofeedback and make any changes or improvements to the scenario we

have chosen."

Provided by The Peninsula College of Medicine and Dentistry

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