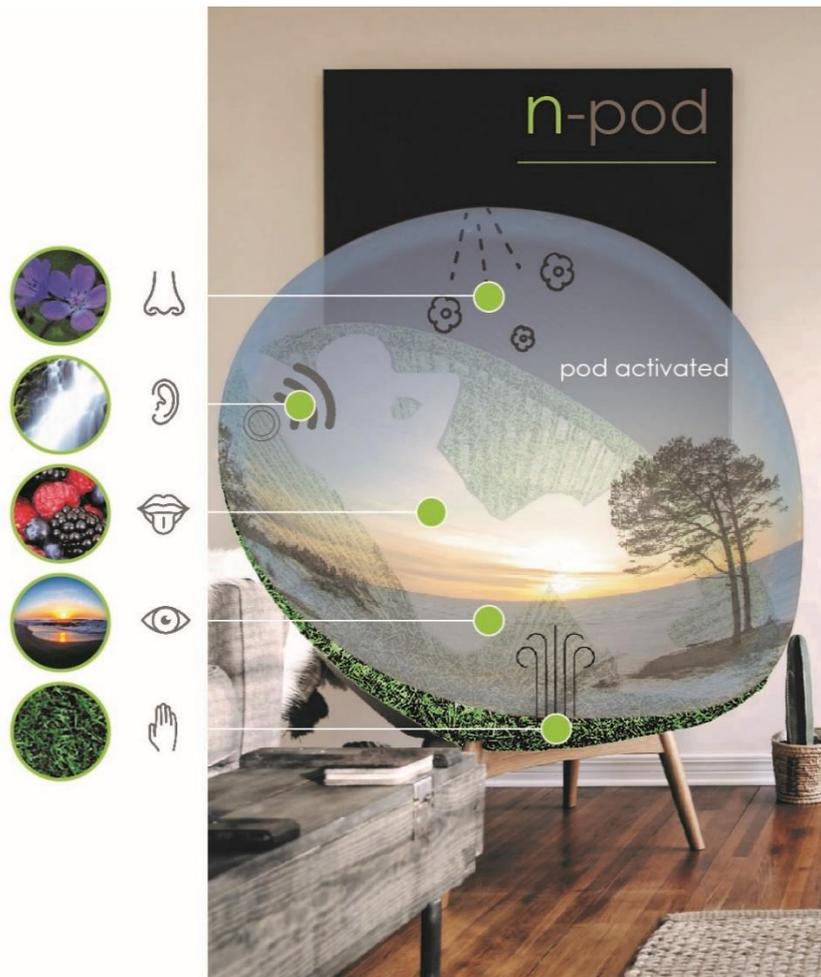


Supporting Document - Lisa Manara Submission

n-pod: a multisensorial natural environment pod experience



n-pod is a design solution to help keep people healthy, focusing on 'wellness' rather than 'illness' and a more proactive model of prevention, health maintenance and long-term wellbeing (1). Hence creating a more resilient society and saving money and resources in the long-term by keeping people healthy, rather than dealing with critical illness and increasing chronic health problems. **n-pod** is a place for anyone to escape and rejuvenate by being transported into a natural environment of one's choice to experience the restorative effects of nature. It is a multi-sensorial experience, controlled by the user, which incorporates projected images of nature onto the dome covering, whilst sitting on a soft grass-covered lounge chair with sounds of nature & flowing water being played and natural aromas released into the pod environment. A fan also recreates a gentle breeze and the option of directed warmth to emulate the heat of

the sun onto the skin's surface. The double layered dome covering structure enables optional circulation of water to flow through it, hence enabling the user to have the sensation of being surrounded by gentle water movement. **n-pod** brings the outside in. Especially for older adults or those unable to go out and get regular doses of nature, especially during the pandemic lockdown, times of quarantine or shielding. It provides a space of retreat and recuperation and the opportunity to restore mental and attentional capacity, (directed attention), reduce stress and anxiety, lower heart rate, blood pressure and blood sugar and enhance relaxation, positivity, mental health and general wellbeing. Also aiding the management of chronic health conditions.

n-pod can also be used by healthcare workers within their home environment or included in hospital spaces as recuperation zones for use after/ during intense ward shifts; supporting them to have healthier lives. The n-pod concept can also be extended to smaller domes just covering the user's head, yet still providing a multisensorial natural environment experience within the home environment, see figure 1.



Figure 1: n-pod – a multisensorial natural environment experience, extended to smaller head-covering domes (man figure image source: <https://www.pngitem.com/userpic/6562/>)

Large bodies of research show beneficial and restorative effects of nature on health and wellbeing. This is not only from direct exposure to natural environments, but also indirect exposure through viewing nature via photographs, plants or through windows. For example, natural scenery views from hospital windows were seen to enhance recovery in surgical patients (2). Hartig et al. (3) and Berto (4) discovered benefits of participants viewing photos of nature as opposed to urban views. This was associated with reduced stress and enhanced emotion (3) and restored mental and direct

attention fatigue (4). Research has also shown psychophysiological benefits from nature whilst sitting passively, demonstrated in the practice of Japanese Forest bathing (Shinrin-yoku) (5). Chorong et al. (6) considered the combined effect of indirect exposure to forest-related visual and scent stimuli which induced decreased cerebral blood flow in the prefrontal cortex, decreased sympathetic nervous system activity, ('fight or flight') and enhanced mood response. Similar physiological and psychological relaxation effects were shown by touching hinoki wood versus other materials (7,8) and when listening to nature-derived sounds (9-11). There are many theories and research to explain the restorative effects and enhanced wellbeing of natural environments including Attention Restoration Theory (ART) (12-16), biophilia and biophilic design (17), blue space theory (18) and ecological valence theory (18).

Attention Restoration Theory (ART) explains key factors encompassed in nature that restores directed attention. Directed attention involves top-down control and the ability to focus on a goal-orientated task without becoming distracted from other stimuli. Directed attention is crucial to effective cognitive and emotional functioning and short-term memory. Daily life and work demands, pandemic and lockdown stresses, dealing with illness and the cognitive demands of diagnosis and treatments, chronic health conditions and so on, all lead to attentional fatigue. The soft fascination stimuli of nature can restore this directed attention fatigue by attracting attention in a bottom-up manner, (involuntary attention), enabling the enjoyment of effortless attention whilst directed attention mechanisms rest and recover.

Biophilia is '...our instinctual desire for nature' and to seek a safe environment which allows our bodies and brains to restore (17). It is derived from our evolution and its influence on our psychology and physiology to this day. Physical environments can differ depending on the different risk and survival messages they convey, as illustrated in figure 2 below.

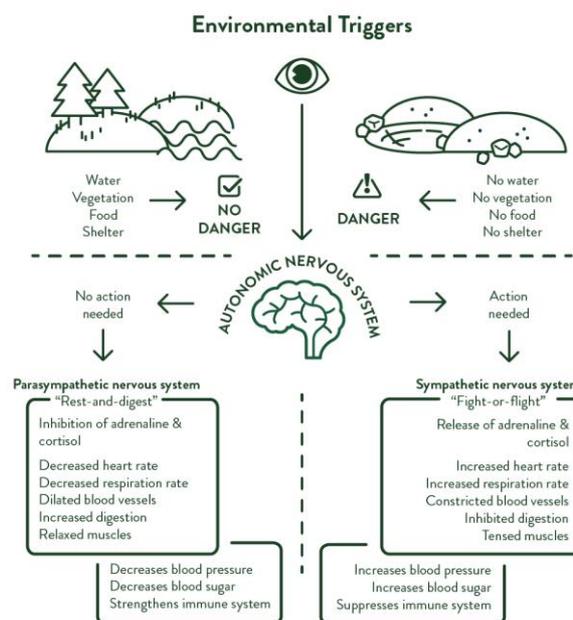


Figure 2: Environmental Triggers on the Autonomic System (17)

Our body's autonomic nervous system keeps a balance between the 'fight or flight' response to stressful or fearful situations and the 'rest and digest' response. Modern lifestyles are, however, frequently filled with stressful scenarios. Chronic stress is detrimental to health, especially due to increased blood pressure, blood sugar and suppressed immune systems. The recent COVID-19 pandemic has compounded daily living stresses with waking hours often being spent in confined spaces, working from home, home schooling and looking after children at home, employing higher standards of cleaning, acoustic difficulties and limited space for retreating and relaxing. Modern living environments often also lack visual clues and elements of nature that can enable our brains to relax. Incorporation of **biophilic design** (17) can create positive spaces that enable this interaction with nature and multi-sensory experiences, also encouraging mindfulness and connecting to the present moment through connection with the five senses. **Ecological valence theory** (18) explains our preferences towards colours that remind us of nature and the resulting positive physiological and wellbeing effects of using such colours or using materials, textures and patterns that mimic nature. **Blue space theory** (18) explains the positive physiological and wellbeing effects of incorporating water into our environments.

‘By 2050, **66%** of the developed world will be urbanised, and thus we are becoming increasingly distant from nature’ (18, p.10)

‘In the UK in 2015/ 16, **11.7 million** working days were lost due to stress’ (18, p.10)

‘In 2002, the European Commission calculated the costs of work-related stress in the EU at **20 billion Euros** a year’ (18, p.10)

References

1. Montgomery HE, Haines A, Marlow N, Pearson G, Mythen MG, Grocott MPW and Swanton C. The Future of UK Healthcare: Problems and Potential Solutions to a System in Crisis. *Annals of Oncology*. 2017; 28:1751-1755.
2. Ulrich R. S. View Through a Window May Influence Recovery from Surgery. *Science*. 1984; 224 (4647): 420–421. Available from: doi: 10.1126/science.6143402.
3. Hartig T, Böök A, Garvill J, Olsson T and Gärling T. Environmental Influences on Psychological Restoration. *Scandinavian Journal of Psychology*. 1996; 37: 378–393. Available from: doi: 10.1111/j.1467-9450.1996.tb00670.x.
4. Berto, R. Exposure to Restorative Environments Helps Restore Attentional Capacity. *Journal of Environmental Psychology*. 2005; 25: 249-259. Available from: doi: 10.1016/j.jenvp.2005.07.001.

5. Park BJ, Tsunetsugu Y, Kasetani T, Kagawa T, and Miyazaki Y. The Physiological Effects of Shinrin-Yoku (Taking in The Forest Atmosphere or Forest Bathing): Evidence from Field Experiments in 24 Forests Across Japan. *Environmental Health and Preventative Medicine*. 2010; 15 (1): 18–26. Available from: doi: 10.1007/s12199-009-0086-9.
6. S Chorong, I Harumi, Y Miyazaki. Physiological Effects of Forest-Related Visual, Olfactory, and Combined Stimuli on Humans: An Additive Combined Effect. *Urban Forestry & Urban Greening*. 2019; 44 (126437): 1-7. Available from: doi: 10.1016/j.ufug.2019.126437.
7. Ikei H, Song C, Miyazaki Y. Physiological Effects of Touching Wood. *International Journal of Environmental Research and Public Health*. 2017;14 (801): 1-13. Available from: doi:10.3390/ijerph14070801.
8. Ikei H, Song C, Miyazaki Y. Physiological Effects of Touching Hinoki Cypress (*Chamaecyparis obtusa*). *Journal of Wood Science*. 2018; 64: 226–236. Available from: doi:10.1007/s10086-017-1691-7.
9. Ghezeljeh TN, Nasari M, Haghani H, Loieh HR. The Effect of Nature Sounds on Physiological Indicators Among Patients in The Cardiac Care Unit. *Complementary Therapies in Clinical Practice*. 2017; 29: 147–152. Available from: doi:10.1016/j.ctcp.2017.09.010.
10. Jo H, Song C, Ikei H, Enomoto S, Kobayashi H and Miyazaki Y. Physiological and Psychological Effects of Forest and Urban Sounds Using High-Resolution Sound Sources. *International Journal of Environmental Research and Public Health*. 2019; 16 (2649): 1-13. Available from: doi: 10.3390/ijerph16152649.
11. Lee WP, Wu PY, Lee MY, Ho LH, Shih WM. Music Listening Alleviates Anxiety and Physiological Responses in Patients Receiving Spinal Anaesthesia. *Complementary Therapies Medicine*. 2017; 31: 8–13. Available from: doi: 10.1016/j.ctim.2016.12.006.
12. Ottosson J. and Grahn P. A Comparison of Leisure Time spent in a Garden with Leisure Time Spent Indoors: On Measures of Restoration in Residents in Geriatric Care. *Landscape Research*. 2005; 30 (1): 23–55. Available from: doi: 10.1080/0142639042000324758.
13. Sonntag-Ostroöm E, Stenlund T, Nordin M, Lundell Y, Ahlgren C, Fjellman-Wiklund A, Järnholm LS, Dolling A. "Nature's Effect on My Mind" – Patients' Qualitative Experiences of a Forest-Based Rehabilitation Programme. *Urban Forestry & Urban Greening*. 2015; 14: 607-614. Available from: doi: oi.org/10.1016/j.ufug.2015.06.002.
14. Berman MG, Jonides J and Kaplan S. The Cognitive Benefits of Interacting with Nature. *Psychological Science*. 2008; 19 (12):1207-1212. Available from: doi: 10.1111/j.1467- 9280.2008.02225.x.
15. Kaplan S. and Berman MG. Directed Attention as a Common Resource for Executive Functioning and Self-Regulation. *Perspectives on Psychological Science*. 2010; 5 (1): 43- 57. Available from: doi: 10.1177/1745691609356784.
16. Kaplan S. The Restorative Benefits of Nature: Toward an Integrative Framework. *Journal of Environmental Psychology*. 1995; 15: 169–182. Available from: doi: 10.1016/0272- 4944(95)90001-2.
17. Heiskanen S. Biophilia - The Love of Life and All Living Systems. 2017. Available from: <https://www.naava.io/editorial/biophilia-love-of-life>. [Accessed May 2020].
18. Heath O, Jackson V and Goode E. *Creating Positive Spaces Using Biophilic Design*. Oliver Health Design. 2018.