

Research

Effects of Multisensory Virtual Forest Bathing on Stress and Well-Being in Young Adults: Protocol for a Randomised Controlled Trial

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Background: In today's rapidly changing world, individuals are confronted with mounting levels of stress, which contribute to various mental and physical diseases. Forest bathing, called *Shinrin Yoku*, is an effective approach for reducing stress and improving mental and physical well-being. However, physical access to a natural environment is not always feasible, particularly for individuals with movement restrictions. One potential solution is the use of virtual reality (VR) for forest bathing. Previous studies have demonstrated that VR forest bathing has comparable effects on stress levels, vitality, and emotional well-being as real forest bathing. Further investigation is required to evaluate the effects of multisensory stimulation, for example olfactory stimuli during VR forest bathing.

This study aims to evaluate whether VR forest bathing enhanced by olfactory stimulation leads to greater stress reduction of young adults than an immersive VR forest bathing without olfactory stimulation.

Methods: A randomized controlled trial will be conducted to investigate the effects of multisensory VR forest bathing on stress reduction in comparison to VR forest bathing without olfactory stimuli. All participants will receive three different conditions (VR, video, and grey screen) in a randomized order. The study population will consist of 128 participants aged 18-40 years. In addition to stress reduction (measured by PANAS) as the primary outcome, restoration, vitality, sense of presence, and cybersickness will be assessed before and after each condition. Additionally, objective stress measures, such as heart rate variability, respiratory activity, and electrodermal activity, will be monitored.

Outlook: The overarching goal is to test whether olfactory stimulation enhances the stress-reducing effects of VR forest bathing and, if proven effective, to establish this as an easily accessible coping tool for individuals with movement restrictions.

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