

Neuro-Cognitive Effects of Nature Experience on Directed Attention

Abstract

Humans and nature have shared a close interrelationship in the past. Natural environments have been sought for both physical as well as psychological restoration. In literature, the experiences while being in natural surroundings have been referred to as 'nature experience'. Several theoretical frameworks have proposed pathways through which nature experience may affect mental wellbeing. One of the theories suggests that 'elements' in nature effortlessly engages the attention, thus giving directed attention a chance to rest and replenish.

This doctoral research has studied the effects of nature experience on directed attention through two studies. The first study was a cross-sectional study, which examined the association of nature experience with attention. Self-reported questionnaires pertaining to different possible human-nature interaction models have been studied. The second study was a lab-based experimental study, with a pre-post design using nature audio-video as stimulus. Neurophysiological data using electroencephalography (EEG) was collected on cognitive tasks pre and post the nature stimulus.

Findings from the cross-sectional study suggest a significant relationship between the nature experience and the individual's ability to direct attention. Further, nature relatedness was found to strengthen the association of nature experience and the individual's ability to direct attention. It was also found that people who have nature in the neighbourhood and frequently visit such places report being higher on the individual's ability to direct attention. Interestingly, nature in the current neighbourhood was not found to be associated with an individual's ability to direct attention, and the relationship was significant only when the individual reported to visit the nature-rich areas frequently.

Outcomes from the lab-based EEG study has shown a significant improvement in the cognitive task performance after nature experience. During the viewing of nature audio-visual, participants

self-reported that they experienced feelings of increased 'peace', 'calmness', and 'relaxation'. The self-reported experiences also correlated with the EEG data. Spectral analysis showed a significantly enhanced alpha in frontal and theta in fronto-central regions while watching nature stimuli. This pattern is an indicator of the state of relaxation and internalized attention. ERP analysis of EEG data found a significant decrease in the N2 and P3 mean amplitudes during the cognitive tasks post nature stimuli, which suggests an improved ability to inhibit the distractions and efficient allocation of attentional resources in the fronto-parietal attentional network. Given the findings from the EEG study, this thesis argues that nature experience deactivates task-irrelevant processing and activates task-related brain areas. The deactivation of task-irrelevant processing means lower distraction and therefore, lesser mental effort required for inhibitory control.

This thesis has provided evidence using cognitive assessment, neurophysiological measurements and self-reports, which suggests that the nature experience induces a relaxed state of mind and enhances directed attention which can be attributed to improved inhibitory control. This evidence may help motivate people to connect with nature for improved cognitive performance.

