

Watching 3-D videos of trees helps people recover from stress

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Viewing 3-D videos of tree-lined residential streets significantly aids in people's recovery from stressful events, according to research by lecturer Bin Jiang (right) and professor William C. Sullivan, both in the department of landscape architecture. (Not pictured) Linda Larsen, an instructor of English, and landscape architecture graduate student Dongying Li were co-authors on a paper about the study. Credit: L. Brian Stauffer

Writers, outdoor enthusiasts and leaf-peeping tourists have known for centuries that nature has restorative powers that reduce feelings of stress and promote a sense of tranquility.

While numerous studies have affirmed nature's [stress-reduction](#) properties, scientists haven't known the specific amount of exposure needed to induce these calming effects.

However, a study led by researchers at the University of Illinois is believed to be the first study to describe a dose-response curve derived from exposure to nature.

Researcher Bin Jiang and his colleagues found that viewing 3-D videos of residential streets with varying amounts of [tree canopy](#) significantly improved participants' physiological and psychological recovery from a stressful experience.

"For males, exposure to a six-minute video with moderate tree cover density evoked about three times the stress reduction as watching a video with no trees," said Jiang, a postdoctoral fellow and lecturer at Illinois who conducted the research at the university for his doctoral dissertation in landscape architecture.

To induce moderate stress, the study participants – 80 men and 78 women – delivered five-minute impromptu speeches before two interviewers and a video camera. Participants then solved several subtraction problems out loud, without using computing devices, paper or pencil.

Afterwards, participants were randomly assigned to watch one of 10 panoramic 3-D videos that showed similar neighborhood streets on which the density of tree cover ranged from 2 to 62 percent.

Multiple measures were used to assess participants' stress levels and recovery during the experiment, including skin conductance, salivary cortisol levels and self-reports.

Skin conductance, which is a measurement of the skin's ability to conduct electricity, is directly related to the amount of sweat present on the skin. The steroid hormone cortisol is released by the adrenal cortex in response to stress.

Among the male participants, the researchers found a bell-shaped dose-response curve. As the tree canopy increased from 2 to 24 percent, the men's biomarkers of stress recovery improved proportionally. The men experienced the most stress recovery benefits when they viewed tree canopy in the 24 to 34 percent range, and stress recovery declined when the percentage of tree cover surpassed 34 percent.

While women did not show the same physiological responses in salivary cortisol and skin conductance levels as the men, the researchers' analyses of the

self-reports suggested that the women also experienced stress reduction benefits that increased proportionally with the percentage of tree canopy viewed.

Less than half – 41 percent – of male and female participants who watched videos with minimal tree canopy described calming effects in their self reports. However, when the percentage of tree canopy increased to 36 percent, more than 90 percent of viewers reported feeling calm or relaxed while watching the videos.

And all of the participants who viewed videos with the maximum percentage of tree canopy reported feelings of well-being.

"We found with the self-reports that participants who watched a video with 62 percent density reduced their [stress levels](#) by 60 percent; compared with their counterparts who watched a video with about 2 percent tree cover," Jiang said.

"Most studies just give a general comparison between exposure to barren and green urban landscapes," Jiang said. "The range of [tree cover](#) density in these videos, the multiple measures used and the dose-response provide solid evidence that urban trees are important to human health."

Higher levels of stress have been linked to several of the leading causes of death in the U.S. – such as cardiovascular disease, stroke, diabetes, some cancers and suicide. "The study suggests that maybe by creating widely dispersed areas within communities you can help reduce the [stress](#) people experience on an everyday basis, which contributes to these diseases," said William C. Sullivan, a professor of landscape architecture at the university and one of Jiang's co-authors.

"These studies have a bearing on how we design places, from the smallest aspect of a house, such as the number of windows and the orientation of the views, to the design of a neighborhood," Sullivan said. "We have to be vigilant about protecting easy access to natural or green spaces for people and the design of cities. We should have interconnected and widely dispersed green spaces accessible to all inhabitants. And my sense is that

when we do that, we'll reap tremendous ecological and human health benefits."

A paper about the research was published recently in the journal *Environment and Behavior*. Co-authors of that paper were Linda Larsen, a senior instructor of English at Illinois; Dongying Li, a doctoral candidate in landscape architecture at Illinois; and Sullivan.

A second paper has been accepted for publication in the journal *Landscape and Urban Planning*. Chun-Yen Chang, director of the Healthy Landscapes, Healthy People Lab at National Taiwan University, and Sullivan were Jiang's co-authors on that paper.

Jiang recently accepted a faculty appointment in [landscape architecture](#) at the University of Hong Kong, which he will begin in January 2015.

More information: "A Dose-Response Curve Describing the Relationship Between Urban Tree Cover Density and Self-Reported Stress Recovery." *Environment and Behavior* 0013916514552321, first published on September 25, 2014 [DOI: 10.1177/0013916514552321](#)

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