

## **How the city hurts your brain ...And what you can do about it**

By Jonah Lehrer | January 2, 2009

THE CITY HAS always been an engine of intellectual life, from the 18th-century coffeehouses of London, where citizens gathered to discuss chemistry and radical politics, to the Left Bank bars of modern Paris, where Pablo Picasso held forth on modern art. Without the metropolis, we might not have had the great art of Shakespeare or James Joyce; even Einstein was inspired by commuter trains.

And yet, city life isn't easy. The same London cafes that stimulated Ben Franklin also helped spread cholera; Picasso eventually bought an estate in quiet Provence. While the modern city might be a haven for playwrights, poets, and physicists, it's also a deeply unnatural and overwhelming place.

Now scientists have begun to examine how the city affects the brain, and the results are chastening. Just being in an urban environment, they have found, impairs our basic mental processes. After spending a few minutes on a crowded city street, the brain is less able to hold things in memory, and suffers from reduced self-control. While it's long been recognized that city life is exhausting -- that's why Picasso left Paris -- this new research suggests that cities actually dull our thinking, sometimes dramatically so.

"The mind is a limited machine," says Marc Berman, a psychologist at the University of Michigan and lead author of a new study that measured the cognitive deficits caused by a short urban walk. "And we're beginning to understand the different ways that a city can exceed those limitations."

One of the main forces at work is a stark lack of nature, which is surprisingly beneficial for the brain. Studies have demonstrated, for instance, that hospital patients recover more quickly when they can see trees from their windows, and that women living in public housing are better able to focus when their apartment overlooks a grassy courtyard. Even these fleeting glimpses of nature improve brain performance, it seems, because they provide a mental break from the urban roil.

This research arrives just as humans cross an important milestone: For the first time in history, the majority of people reside in cities. For a species that evolved to live in small, primate tribes on the African savannah, such a migration marks a dramatic shift. Instead of inhabiting wide-open spaces, we're crowded into concrete jungles, surrounded by taxis, traffic, and millions of strangers. In recent years, it's become clear that such unnatural surroundings have important implications for our mental and physical health, and can powerfully alter how we think.

This research is also leading some scientists to dabble in urban design, as they look for ways to make the metropolis less damaging to the brain. The good news is that even slight alterations, such as planting more trees in the inner city or creating urban parks with a greater variety of plants, can significantly reduce the negative side effects of city life. The mind needs nature, and even a little bit can be a big help.

Consider everything your brain has to keep track of as you walk down a busy thoroughfare like Newbury Street. There are the crowded sidewalks full of distracted pedestrians who have to be avoided; the hazardous crosswalks that require the brain to monitor the flow of traffic. (The brain is a wary machine, always looking out for potential threats.) There's the confusing urban grid, which forces people to think continually about where they're going and how to get there.

The reason such seemingly trivial mental tasks leave us depleted is that they exploit one of the crucial weak spots of the brain. A city is so overstuffed with stimuli that we need to constantly redirect our attention so that we aren't distracted by irrelevant things, like a flashing neon sign or the cellphone conversation of a nearby passenger on the bus. This sort of controlled perception -- we are telling the mind what to pay attention to -- takes energy and effort. The mind is like a powerful supercomputer, but the act of paying attention consumes much of its processing power.

Natural settings, in contrast, don't require the same amount of cognitive effort. This idea is known as attention restoration theory, or ART, and it was first developed by Stephen Kaplan, a psychologist at the University of Michigan. While it's long been known that human attention is a scarce resource -- focusing in the morning makes it harder to focus in the afternoon -- Kaplan hypothesized that immersion in nature might have a restorative effect.

Imagine a walk around Walden Pond, in Concord. The woods surrounding the pond are filled with pitch pine and hickory trees. Chickadees and red-tailed hawks nest in the branches; squirrels and rabbits skirmish in the berry bushes. Natural settings are full of objects that automatically capture our attention, yet without triggering a negative emotional response -- unlike, say, a backfiring car. The mental machinery that directs attention can relax deeply, replenishing itself.

"It's not an accident that Central Park is in the middle of Manhattan," says Berman. "They needed to put a park there."

In a study published last month, Berman outfitted undergraduates at the University of Michigan with GPS receivers. Some of the students took a stroll in an arboretum, while others walked around the busy streets of downtown Ann Arbor.

The subjects were then run through a battery of psychological tests. People who had walked through the city were in a worse mood and scored significantly lower on a test of attention and working memory, which involved repeating a series of numbers backwards. In fact, just glancing at a photograph of urban scenes led to measurable impairments, at least when compared with pictures of nature.

"We see the picture of the busy street, and we automatically imagine what it's like to be there," says Berman. "And that's when your ability to pay attention starts to suffer."

This also helps explain why, according to several studies, children with attention-deficit disorder have fewer symptoms in natural settings. When surrounded by trees and

animals, they are less likely to have behavioral problems and are better able to focus on a particular task.

Studies have found that even a relatively paltry patch of nature can confer benefits. In the late 1990s, Frances Kuo, director of the Landscape and Human Health Laboratory at the University of Illinois, began interviewing female residents in the Robert Taylor Homes, a massive housing project on the South Side of Chicago.

Kuo and her colleagues compared women randomly assigned to various apartments. Some had a view of nothing but concrete sprawl, the blacktop of parking lots and basketball courts. Others looked out on grassy courtyards filled with trees and flowerbeds. Kuo then measured the two groups on a variety of tasks, from basic tests of attention to surveys that looked at how the women were handling major life challenges. She found that living in an apartment with a view of greenery led to significant improvements in every category.

"We've constructed a world that's always drawing down from the same mental account," Kuo says. "And then we're surprised when [after spending time in the city] we can't focus at home."

But the density of city life doesn't just make it harder to focus: It also interferes with our self-control. In that stroll down Newbury, the brain is also assaulted with temptations -- caramel lattes, iPods, discounted cashmere sweaters, and high-heeled shoes. Resisting these temptations requires us to flex the prefrontal cortex, a nub of brain just behind the eyes. Unfortunately, this is the same brain area that's responsible for directed attention, which means that it's already been depleted from walking around the city. As a result, it's less able to exert self-control, which means we're more likely to splurge on the latte and those shoes we don't really need. While the human brain possesses incredible computational powers, it's surprisingly easy to short-circuit: all it takes is a hectic city street.

"I think cities reveal how fragile some of our 'higher' mental functions actually are," Kuo says. "We take these talents for granted, but they really need to be protected."

Related research has demonstrated that increased "cognitive load" -- like the mental demands of being in a city -- makes people more likely to choose chocolate cake instead of fruit salad, or indulge in a unhealthy snack. This is the one-two punch of city life: It subverts our ability to resist temptation even as it surrounds us with it, from fast-food outlets to fancy clothing stores. The end result is too many calories and too much credit card debt.

City life can also lead to loss of emotional control. Kuo and her colleagues found less domestic violence in the apartments with views of greenery. These data build on earlier work that demonstrated how aspects of the urban environment, such as crowding and unpredictable noise, can also lead to increased levels of aggression. A tired brain, run down by the stimuli of city life, is more likely to lose its temper.

Long before scientists warned about depleted prefrontal cortices, philosophers and landscape architects were warning about the effects of the undiluted city, and looking for ways to integrate nature into modern life. Ralph Waldo Emerson advised people to "adopt the pace of nature," while the landscape architect Frederick Law Olmsted sought to create vibrant urban parks, such as Central Park in New York and the Emerald Necklace in Boston, that allowed the masses to escape the maelstrom of urban life.

Although Olmsted took pains to design parks with a variety of habitats and botanical settings, most urban greenspaces are much less diverse. This is due in part to the "savannah hypothesis," which argues that people prefer wide-open landscapes that resemble the African landscape in which we evolved. Over time, this hypothesis has led to a proliferation of expansive civic lawns, punctuated by a few trees and playing fields.

However, these savannah-like parks are actually the least beneficial for the brain. In a recent paper, Richard Fuller, an ecologist at the University of Queensland, demonstrated that the psychological benefits of green space are closely linked to the diversity of its plant life. When a city park has a larger variety of trees, subjects that spend time in the park score higher on various measures of psychological well-being, at least when compared with less biodiverse parks.

"We worry a lot about the effects of urbanization on other species," Fuller says. "But we're also affected by it. That's why it's so important to invest in the spaces that provide us with some relief."

When a park is properly designed, it can improve the function of the brain within minutes. As the Berman study demonstrates, just looking at a natural scene can lead to higher scores on tests of attention and memory. While people have searched high and low for ways to improve cognitive performance, from doping themselves with Red Bull to redesigning the layout of offices, it appears that few of these treatments are as effective as simply taking a walk in a natural place.

Given the myriad mental problems that are exacerbated by city life, from an inability to pay attention to a lack of self-control, the question remains: Why do cities continue to grow? And why, even in the electronic age, do they endure as wellsprings of intellectual life?

Recent research by scientists at the Santa Fe Institute used a set of complex mathematical algorithms to demonstrate that the very same urban features that trigger lapses in attention and memory -- the crowded streets, the crushing density of people -- also correlate with measures of innovation, as strangers interact with one another in unpredictable ways. It is the "concentration of social interactions" that is largely responsible for urban creativity, according to the scientists. The density of 18th-century London may have triggered outbreaks of disease, but it also led to intellectual breakthroughs, just as the density of Cambridge -- one of the densest cities in America -- contributes to its success as a creative center. One corollary of this research is that less dense urban areas, like Phoenix, may, over time, generate less innovation.

The key, then, is to find ways to mitigate the psychological damage of the metropolis while still preserving its unique benefits. Kuo, for instance, describes herself as "not a nature person," but has learned to seek out more natural settings: The woods have become a kind of medicine. As a result, she's better able to cope with the stresses of city life, while still enjoying its many pleasures and benefits. Because there always comes a time, as Lou Reed once sang, when a person wants to say: "I'm sick of the trees/take me to the city."

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