Slow Down, Brave Multitasker, and Don't Read This in Traffic

Hiroko Masuike for The New York Times

On bicycle, on foot and often behind the wheel, users of digital devices present potentially dangerous scenes every day in Manhattan. More Photos >

By STEVE LOHR
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Correction Appended

Confident multitaskers of the world, could I have your attention?

Think you can juggle phone calls, e-mail, instant messages and computer work to get more done in a time-starved world? Read on, preferably shutting out the cacophony of digital devices for a while.

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Multitaskers of Manhattan

Several research reports, both recently published and not yet published, provide evidence of the limits of multitasking. The findings, according to neuroscientists, psychologists and management professors, suggest that many people would be wise to curb their multitasking behavior when working in an office, studying or driving a car.

These experts have some basic advice. Check e-mail messages once an hour, at most. Listening to soothing background music while studying may improve concentration. But other distractions — most songs with lyrics, instant messaging, television shows — hamper performance. Driving while talking on a cellphone, even with a hands-free headset, is a bad idea.

In short, the answer appears to lie in managing the technology, instead of merely yielding to its incessant tug.

"Multitasking is going to slow you down, increasing the chances of mistakes," said David E. Meyer, a cognitive

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Photographs by Hiroko Masuike for The New York Times

Juggling activities in Times Square. When people divide their attention, they react more slowly and make more mistakes, scientists say. More Photos »

scientist and director of the Brain, Cognition and Action Laboratory at the University of Michigan. "Disruptions and interruptions are a bad deal from the standpoint of our ability to process information."

The human brain, with its hundred billion neurons and hundreds of trillions of synaptic connections, is a cognitive powerhouse in many ways. "But a core limitation is an inability to concentrate on two things at once," said René Marois, a neuroscientist and director of the Human Information Processing Laboratory at Vanderbilt University.

Mr. Marois and three other Vanderbilt researchers reported in an article last December in the journal Neuron that they used magnetic resonance imaging to pinpoint the bottleneck in the brain and to measure how much efficiency is lost when trying to handle two tasks at once.

Study participants were given two tasks and were asked to respond to sounds and images. The first was to press the correct key on a computer keyboard after hearing one of eight sounds. The other task was to speak the correct vowel after seeing one of eight images.

The researchers said that they did not see a delay if the participants were given the tasks one at a time. But the researchers found that response to the second task was delayed by up to a second when the study participants were given the two tasks at about the same time.

In many daily tasks, of course, a lost second is unimportant. But one implication of the Vanderbilt research, Mr. Marois said, is that talking on a cellphone while driving a car is dangerous. A one-second delay in response time at 60 miles an hour could be fatal, he noted.

"We are under the impression that we have this brain that can do more than it often can," observed Mr. Marois, who said he turns off his cellphone when driving.

The young, according to conventional wisdom, are the most adept multitaskers. Just look at teenagers and young workers in their 20s, e-mailing, instant messaging and listening to iPods at once.

Recently completed research at the Institute for the Future of the Mind at Oxford University suggests the popular perception is open to question. A group of 18- to 21-year-olds and a group of 35- to 39-year-olds were given 90 seconds to translate images into numbers, using a simple code.

The younger group did 10 percent better when not interrupted. But when both groups were interrupted by a phone call, a cellphone short-text message or an instant message, the older group matched the younger group in speed and accuracy.

"The older people think more slowly, but they have a faster fluid intelligence, so they are better able to block out interruptions and choose what to focus on," said Martin Westwell, deputy director of the institute.

Mr. Westwell is 36, and thus, should be better able to cope with interruptions. But he has modified his work habits since completing the research project last month.

"I check my e-mail much less often," he said. "The interruptions really can throw you off-track."

In a recent study, a group of Microsoft workers took, on average, 15 minutes to return to serious mental tasks, like writing reports or computer code, after responding to incoming e-mail or instant messages. They strayed off to reply to other messages or browse news, sports or entertainment Web sites.

"I was surprised by how easily people were distracted and how long it took them to get back to the task," said Eric Horvitz, a Microsoft research scientist and co-author, with Shamsi Iqbal of the University of Illinois, of a paper on the study that will be presented

next month.

"If it's this bad at Microsoft," Mr. Horvitz added, "it has to be bad at other companies, too."

In the computer age, technology has been seen not only as a factor contributing to information overload but also as a tool for coping with it. Computers can help people juggle workloads, according a paper presented this month at a conference at the National Bureau of Economic Research. The researchers scrutinized the work at an unnamed executive recruiting firm, including projects and 125,000 e-mail messages. They also examined the firm revenues, people's compensation and the use of information technology by the recruiters.

The recruiters who were the heaviest users of e-mail and the firm's specialized database were the most productive in completing projects. "You can use the technology to supplement your brain and keep track of more things," said Erik Brynjolfsson of the Sloan School of Management at the Massachusetts Institute of Technology and a co-author of the paper, along with Sinan Aral of the Stern School of Business at New York University, and Marshall Van Alstyne of Boston University.

But the paper also found that "beyond an optimum, more multitasking is associated with declining project completion rates and revenue generation."

For the executive recruiters, the optimum workload was four to six projects, taking two to five months each.

The productivity lost by overtaxed multitaskers cannot be measured precisely, but it is probably a lot. Jonathan B. Spira, chief analyst at Basex, a business-research firm, estimates the cost of interruptions to the American economy at nearly $650 billion a year.

That total is an update of research published 18 months ago, based on surveys and interviews with professionals and office workers, which concluded that 28 percent of their time was spent on what they deemed interruptions and recovery time before they returned to their main tasks.

Mr. Spira concedes that the $650 billion figure is a rough estimate — an attempt to attach a number to a big problem. Work interruptions will never — and should not — be eliminated, he said, since they are often how work is done and ideas are shared. After all, one person's interruption is another's collaboration.

The information age is really only a decade or two old in the sense of most people working and communicating on digital devices all day, Mr. Spira said. In the industrial era, it took roughly a century until Frederick Winslow Taylor in 1911 published his principles of "scientific management" for increasing worker productivity.

"We don't have any equivalent yet for the knowledge economy," Mr. Spira said.

But university and corporate researchers say they can help. Brain scans, social networking algorithms and other new tools should help provide a deeper understanding of the limits and the potential of the human brain, they said. That will teach workers in groups how to manage the overload of digital communications efficiently.

A new organization, the Institute for Innovation and Information Productivity, whose sponsors include Hewlett-Packard, Microsoft and Johnson & Johnson, has been created to sponsor such research. It provided money for the recent research project at Oxford's Institute for the Future of the Mind, for example.

Further research could help create clever technology, like sensors or smart software that workers could instruct with their preferences and priorities to serve as a high-tech "time nanny" to ease the modern multitasker's plight.

That is what Mr. Horvitz of Microsoft is working on. "We live in this Wild West of digital communications now," he said. "But I think there's a lot of hope for the future."

Correction: March 26, 2007

A front-page article yesterday about the limits of multitasking misspelled the surname of a cognitive scientist at the University of Michigan, who said that "'Multitasking is going to slow you down, increasing the chances of mistakes." It is David E. Meyer, not Mayer.

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