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**We're all multi-tasking, but what's the cost?; We're just not wired to do so much at once, as stress and mistakes show.; [HOME EDITION]**

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**Full Text** (2135 words)

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Executives revel in it. Parents with jobs and children rely on it. And circus jugglers make it art.

Multi-tasking, for most Americans, has become a way of life. Doing many things at once is the way we manage demands bearing down on us at warp speed, tame a plague of helpful technological devices and play enough roles -- parent, coach, social secretary, executive -- to stage a Broadway show.

But researchers peering into the brains of those engaged in several tasks at once are concluding what some overworked Americans had begun to suspect: that multi-tasking, which many have embraced as the key to success, is instead a formula for shoddy work, mismanaged time, rote solutions, stress and forgetfulness. Not to mention car crashes, kitchen fires, forgotten children, near misses in the skies and other dangers of inattention.

So turn off the music, hang up the phone, pull over to the side of the road and take note: When it comes to using your brain to conduct several tasks at one time, "there is no free lunch," says University of Michigan psychologist David E. Meyer. For all but the most routine tasks -- and few mental undertakings are truly routine -- it will take more time for the brain to switch among tasks than it would have to complete one and then turn to the other.

When the two get squished together, each will be shortchanged, resulting in errors.

And a prolonged jag of extreme multi-tasking, warns Meyer, may lead to a shorter attention span, poorer judgment and impaired memory. A Clint Eastwood fan and admitted poor multi-tasker, Meyer likes to quote Dirty Harry, confronting his nemesis on a pier in one climactic scene: " 'A man's got to know his limitations,' " Meyer says, adding, "and that's basically the deal with multi-tasking. If you try to go beyond them, you just screw yourself up royally."

The term multi-tasking comes from the world of computers, where single-minded engineers could devise systems flexible enough to perform several tasks at once. But the proliferation of computers and their spinoffs -- mobile communications devices and hand-held gadgets -- have made it necessary for their human users

to multi- task as well.

For George Parsons, the founder and chief executive of Secorix Inc. in San Mateo, two desktop computers, a cellphone, a wireless computer device and an electronic pocket organizer pump out a vast and endless stream of demands, choices and information. A practitioner of Transcendental Meditation and a firm believer in frequent visits to the gym, Parsons says he heads off meltdown by quieting his mind and escaping his gadgets several times a week. But sometimes, he says, his wife will call as he teeters on the edge of overload, and he'll snap, hanging up on her with a brusque "can't- deal-with-this-right-now!" dismissal.

That's when flowers are called for, he says.

In recent months, the public debate over multi-tasking has focused largely on cellphones and driving. On July 1, New Jersey became the second state -- behind New York -- to ban drivers from using a cellphone without a headset. Washington, D.C., has adopted a similar ban.

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### Weighing the costs

Meanwhile, in workplaces across the country, multi-tasking and its potential costs have become a prime concern for insurance underwriters, management consultants, efficiency engineers and cognitive scientists. In addition to contributing to communications lapses, rudeness and employee stress, multi-tasking is considered a factor in more serious workplace mishaps -- from medication and treatment errors in hospitals to near misses in the skies. Indeed, the Federal Aviation Administration has underwritten several studies to explore how air-traffic controllers, the multi-tasking virtuosos who orchestrate the nation's air traffic, do what they do -- and where their skills may break down.

The epidemic of multi-tasking even is sending patients to doctors and therapists with complaints of depression, anxiety, forgetfulness and attention deficit disorder. Mostly, says psychiatrist Edward Hallowell of Sudbury, Mass., they have a "severe case of modern life." But their distress is very real, and their organizations are suffering too, he adds.

"The more constant phenomenon is simply impaired performance and a workplace that becomes toxic in a hurry," he says. "They may be meeting their numbers, but they're not as creative, flexible, humorous or innovative as they might be."

Cynthia McClain-Hill, a 46-year-old attorney, law firm owner, mother of two, wife and civic activist. multi-tasks with a vengeance. The Lona Beach resident says it

would not be unusual for her to be checking her BlackBerry (a portable e-mail device) while talking on the cellphone with the newspaper spread out on the passenger's seat of her car (hopefully, she says, while stopped at a red light). But the steel-trap memory that got her through law school without ever taking notes -- and that helps her order dinner for her extended family without any prompting -- is showing signs of wear and tear.

"I often find myself unable to remember my five phone numbers," McClain-Hill says. "That's one of my silent frustrations." And there are more occasions now when she enters a room and realizes she has forgotten the purpose of the trip.

For many women McClain-Hill's age, such bouts of forgetfulness are attributed to age and the effects of changing hormones. Indeed, complaints of forgetfulness among women in their 40s and 50s are so prevalent that Peter M. Meyer, a biostatistician at Chicago's Rush University Medical Center, in the late 1990s conducted a study intended to gauge how deeply the hormone changes of menopause disrupt women's memory.

Instead, he got a lesson on women and multi-tasking. The tests of short-term memory and verbal memory stubbornly showed that women of this age, though they complained of forgetfulness, were not missing a step. Their forgetfulness appeared to be a function of depression, stress and "role overload" -- the multi-tasking of many roles at once -- Meyer concluded.

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The 'executive' brain

The ability to multi-task stems from a spot right behind the forehead. That's the anterior part of the region neuroscientists call the "executive" part of the brain, the prefrontal cortex. When a human is assessing tasks, prioritizing them and assigning mental resources, these frontal lobes are doing most of the work, says Dr. Jordan Grafman, a neuropsychologist and chief of the National Institute of Neurological Disorders and Stroke at the National Institutes of Health.

The same region of the brain is where we pull off another uniquely human trick that is key to multi-tasking: "marking" the spot at which a task has been interrupted, so we can return to it later.

The irony, Grafman says, is that the prefrontal cortex is the part of the human brain that is most damaged as a result of prolonged stress, particularly the kind of stress that makes a person feel out-of-control and helpless. The kind of stress, say, that you might feel when overwhelmed by the demands of multi-tasking. Such stress, Grafman says, also will cause the death of brain cells in another region -- the hippocampus, which is critical to the formation of new memories. Damage there can hobble a person's ability to learn and retain new facts and

skills.

"Multi-tasking, almost by its very nature of course, creates stress," Grafman says. And long-term stress, in turn, is likely to make us less able to multi-task, he says. It's a humbling lesson in the limits we face, he acknowledges. "If you're multi-tasking, and it's very stressful," Grafman says, "you're not going to get better at it."

But you're smarter than those being studied by psychologists and neuroscientists. You can navigate traffic, take a meeting by phone and stop at the dry cleaners along the way, right? Psychologist Yuhong Jiang is likely to deflate such confidence. She recently watched the working brains of students at the Massachusetts Institute of Technology as they tried to do two simple tasks simultaneously -- identify shapes and identify either letters or colors.

When students were shown the two tasks and instructed to do them at the same time, most shrugged and laughed. "They thought it would be easy," especially with the half-hour of practice involved, says Jiang, co-author of the study published in the June issue of Psychological Science.

But when it came time to perform under the scrutiny of a brain scanner, the subjects lost their composure completely, Jiang says. These students -- among the world's brightest -- "were getting very distressed," she says. "They'd be hitting keys very hard and trying to figure it out. And they'd be committing a lot of errors.... And these were very, very simple tasks."

When they were asked to switch between the two tasks, Jiang's student subjects were a bit more accurate. But they were shifting very slowly between tasks -- and the faster they were forced to toggle between the two tasks, the more they slowed down. When those who peer into the working brain see a person slow down the way these students did, they expect to see signs that greater concentration and higher-level thinking have taken over. Neuroscientists expect, in short, to see the brain's frontal lobes "light up" with activity.

But the shadowy images of these subjects' brains at work told a different story. In between tasks, the part of the brain that prioritizes tasks and engages in higher-order thinking was taking a momentary rest. Like a dowdy family computer toggling between functions, the students' frontal lobes effectively went blank, waiting for instructions for the next task to upload.

Madelyn Alfano, a soccer coach, volunteer and mother who owns 10 Italian restaurants scattered throughout Los Angeles, recognizes that feeling. Interrupted by a phone call during a recent meeting, she completed the conversation and walked back to the session -- leaving her coffee behind and wondering along the way whom she had been meeting with and what the

meeting was about.

When she sees that blank look on the face of an overworked employee, she tells him, "Go to the fridge, open the door, and think about why you're here." Then, she hands him a small spiral-bound notebook, like the kind she uses, to write it all down.

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### The rote factor

When he leaves his lab at Carnegie Mellon University, psychologist Marcel Just steers a wide path around motorists jabbering into cellphones. "I grip the steering wheel a little tighter and breathe lighter when they go by," says Just, who has studied the brain science of multi-tasking extensively.

Just is a believer in multi-tasking, and considers himself -- rare among researchers in this field -- pretty good at it. The brain, he contends, is a marvel of flexibility, and it is constantly multi-tasking. But even the human brain's resources are limited, and Just is under no illusions about the quality of the outcome when it does two or more things at once. When it does several tasks that involve conscious attention, the brain "discounts" the attention it applies to each. And, in effect, you get what you pay for, he says.

When a person multi-tasks well -- without errors or disastrous results -- it is usually because one or more of the tasks she is engaged in has become automatic. Humans, he says, can eat lunch and read the paper at the same time, because eating scarcely involves conscious thought. Some of us can transcribe a conversation and grasp its content as well because typing, for these people, has become a skill performed by rote.

Asked whether people can train themselves to become better multi-taskers, Just becomes philosophical. Yes, it should be possible, he says. But there will be a cost: A lot more of the tasks on which we now expend thought (or foresight or empathy or creativity) would have to be put on automatic pilot. We might be able to do more, but we'd forfeit a lot of the subtlety and richness that comes with thought.

This, says psychiatrist Hallowell, is why those in the grips of multi-tasking often appear rude. Having put their communications skills on automatic pilot, "They start behaving like e-mail: impulsive, curt, abrasive, no lead-in, no small talk, no body language," he says. Where creative rethinking might be the better approach to a problem, the multi-tasker will resort to routines and rote solutions.

And that, says attorney McClain-Hill, is when it's time to stop. "I sometimes ask myself. 'Am I able to look up and respond civilly to this person? Am I able to

continue to bounce it back [to take a request and respond as necessary] -- with a degree of ease and grace?' If you can't bounce it back," she says, "you've got to immediately employ some measure to ease the stress, to step out of that traffic, to get a grip."

**[Illustration]**

Caption: PHOTO: (no caption); PHOTOGRAPHER: CHRIS SHARP For The Times

Credit: Times Staff Writer

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