

SUPPLEMENT #10 MULTITASKING

Included here is interesting information regarding multitasking from several sources!

YOU KNOW THE FEELING. You're trying to save time by doing two or three things at once -- sending e-mail while on the phone with your boss, listening to colleague while sorting junk mail, making a list during a meeting. Suddenly, your brain crashes. It can't recall what you just did, what was just said. Accusing eyes turn on you awaiting a response -- to what? Ted Ruddock calls it "having a senior moment" -- and he's only 44. Making three points in a conversation recently, he got to No. 3 -- and blanked. "It's a little scary," says Mr. Ruddock, a Newtown, Conn., chief corporate learning officer, father of three, husband, caregiver to his aged parents and -- not surprisingly -- inveterate multitasker. A growing body of scientific research shows one of jugglers' favorite time-saving techniques, multitasking, can actually make you less efficient and, well, stupider. Trying to do two or three things at once or in quick succession can take longer overall than doing them one at a time, and may leave you with reduced brainpower to perform each task. "There's scientific evidence that multitasking is extremely hard for somebody to do, and sometimes impossible," says David Meyer, a psychology professor at the University of Michigan. Chronic high-stress multitasking also is linked to short-term memory loss. Yet we're clearly engaged in a long-term trend toward doing more of it. Some 45% of American workers feel they are asked or expected to work on too many tasks at once, says a study of 1,003 employees by the Families and Work Institute, New York. Though the research has been applied mostly to the debate over driving with cellphones, or aiding people in mind-boggling jobs like air-traffic control, it has quality-of-life implications too. Some findings:

People who multitask are actually less efficient than those who focus on one project at a time, according to a study published in the *Journal of Experimental Psychology*. The time lost switching among tasks increases with the complexity of the tasks, according to the research by Dr. Meyer and others.

The process of switching back immediately to a task you've just performed, as many multitaskers try to do, takes longer than switching after a bit more time has passed, say findings published last fall by researchers from the National Institute of Mental Health. The reason is that the brain has to overcome "inhibitions" it imposed on itself to stop doing the first task in the first place; it takes time, in effect, to take off the brakes. If you wait several seconds longer before switching tasks, the obstacles imposed by that shutting-off process are reduced.

Managing two mental tasks at once reduces the brainpower available for either task, according to a study published in the journal *NeuroImage*. Marcel Just of Carnegie Mellon University asked subjects to listen to sentences while comparing two rotating objects. Even though these activities engage two different parts of the brain, the resources available for processing visual input dropped 29% if the subject was trying to listen at the same time. The brain activation for listening dropped 53% if the person was trying to process visual input at the same time.

"It doesn't mean you can't do several things at the same time," says Dr. Just, co-director of the university's Center for Cognitive Brain Imaging. "But we're kidding ourselves if we think we can do so without cost."

People who are multitasking too much experience various warning signs; short-term memory problems can be one. Intense multitasking can induce a stress response, an adrenaline rush that when prolonged can damage cells that form new memory, Dr. Meyer says. Other red flags are changes in your ability to concentrate or gaps in your attentiveness.

And some kinds of multitasking just don't work very well. If the tasks require the same parts of the brain, such as two assignments that both draw on language skills, "it's going to be extremely hard to succeed efficiently,"

Dr. Meyer says. Listening for a child playing in the next room while talking to your boss by phone, for instance, creates conflicting auditory-processing demands.

How about sorting junk mail and listening to your child? "We all do that, but we're short-changing the child a little," Dr. Just says. Folding laundry and talking to the boss on the phone? "It depends on the complexity," he says. "For me, towels are easy. But I'd think twice about some complex shirt that needs the folds in the right place."

It's possible to consciously tone your multitasking muscles. Meditation can cultivate the ability to willfully control your mental focus. Other steps may help, such as weeding out distractions, honing your mental skills by making a point of continuously learning about new things, and getting plenty of rest. Practice can also help; studies show it takes less time to switch between tasks you've repeated many times, like tying your shoes and signing your name.

Sometimes, though, the best answer is to put on the brakes. On a drive with his son, Mr. Ruddock caught himself missing his child's account of his day at school because his brain was processing a work problem.

In such moments, he consciously stops and re-focuses. "There's so much energy and wasted time and frustration caused by not being in the moment, and having to go back and retrace ground at the least, and repair damaged relationships at the worst," he says. "We'd all be better off to stay in the moment briefly, to keep our focus and deal with that, and then move on to the next thing." [WSJ.com](#).

Copyright 2001 by Edward Willett:

"Multitasking--doing several tasks simultaneously--sounds like a time management expert's dream. What could be more efficient than, say, driving to work while talking to your secretary about the day's meetings, or writing a report and dictating a letter while also catching the latest stock quotes on TV? There's just one problem--new studies show multitasking doesn't work. One study appeared in the August 1 issue of the journal *NeuroImage*. Dr. Marcel Just, a psychology professor and co-director of the Center for Cognitive Brain Imaging at Carnegie Mellon University in Pittsburgh, and colleagues used magnetic resonance imaging (MRI) to compare brain activity in people performing a single complex task with people performing two tasks at once. The researchers found that when you do two things at once, brain power doesn't increase to meet demand; in fact, it decreases, which means you perform each task more poorly than if you focused on it alone. Active brain cells use more oxygen than inactive brain cells, and thus show up more clearly on MRI scans. Brain activity is measured in "voxels," bits of tissue about the size of a grain of rice. The harder a region of a brain is working, the more voxels light up in the scan. Previous research had shown that when a person attempts to, for example, visually track two objects at once, the region of the brain involved is actually less active than when that person visually tracks a single object. The new study shows that the same thing happens even when two different regions of the brain are in use. The two tasks used in the study were language comprehension (specifically, understanding and responding to complex sentences), which uses the brain's temporal lobe, and mentally rotating objects in space (volunteers were shown pairs of three-dimensional objects and asked to mentally rotate them to decide whether they were identical), which uses the parietal lobe. Eighteen volunteers had their brains scanned while performing one or both tasks. Each task, performed alone, activated 37 voxels in its respective region of the brain. But when both tasks were done at the same time, only 42 voxels activated, not 74. Brain activity generated by mental rotation decreased 29 percent if the person was also listening to a sentence, and activity generated by listening to sentences decreased 53 percent if the person was also attempting mental rotation. The volunteers still successfully completed each task, but it took them longer. This has implications for everything from cell-phone use while driving (talking and driving also use two different regions of the brain) to whether teenagers can really study effectively while watching TV or listening to music. And another study provides further ammunition for those who believe anything worth doing is worth your full concentration. This study, led by Joshua Rubenstein, formerly of the University of Michigan and now with the Federal Aviation

Administration, was published this month in the American Psychological Society's Journal of Experimental Psychology: Human Perception and Performance. It found that multitasking is inefficient because whenever you try to do two things at once, you lose time as you switch from one to the other--and the more complicated the tasks, the longer the switch takes. That's because each time you switch tasks you go through two distinct stages: deciding to do something new, and then turning off the mental rules needed to do the first task and turning on the mental rules needed to do the second. Finally, a third new study focused exclusively on the using-the-cell-phone-while-driving type of multitasking and confirmed it's a really bad idea. On behalf of the U.S.'s National Safety Council, researchers at the University of Utah put drivers in a car and had them brake and stop while also performing a variety of secondary tasks, such as changing radio stations, listening to the radio, listening to books on tape, talking on a hand-held cell phone and talking on a hands-free cell phone. The results: people using a cell phone (and it didn't matter whether it was hands-on or hands-free) were much later braking for red lights--and much more likely to run them--than people who were just listening to the radio or a book on tape. It seems the best way to perform multiple complex tasks is to do them one after the other, giving each your full concentration--especially if the tasks in question are driving a car and talking on the phone. In other words, do us all a favor: pull over."

These weekly columns on science appear in the [Regina \(Saskatchewan\) Leader Post](#) and Red Deer (Alberta) Advocate and on CBC Radio One's Afternoon Edition in Saskatchewan.. They are available for one-time publication or regular syndication to any interested newspapers, magazines or on-line publications. Investigators have mapped a region of the brain responsible for a certain kind of multitasking behavior, the uniquely human ability to perform several separate tasks consecutively while keeping the goals of each task in mind. Using imaging technology, scientists from the National Institute of Neurological Disorders and Stroke (NINDS) found that a specific type of multitasking behavior, called branching, can be mapped to a certain region of the brain that is especially well developed in humans compared to other primates. The study will appear in the May 13, 1999, issue of the journal Nature. "The results of this study suggest that the anterior prefrontal cortex, the area of the brain that is most developed in humans, mediates the ability to depart temporarily from a main task in order to explore alternative tasks before returning to the main task at the departed point," says Jordan Grafman, Ph.D., Chief of the Cognitive Neuroscience Section at the NINDS and a co-author of the study. "We believe that this finding is important because branching processes appear to play a key role in human cognition," says Etienne Koechlin, Ph.D., also of the NINDS Cognitive Neuroscience Section and a co-author of the study. "In everyday life, we often need to interrupt an ongoing task to respond to external events and we all experience how demanding it is to react to these events while keeping our minds on the original task." According to previous studies, humans may be the only species capable of performing branching, which involves keeping a goal in mind over time (working memory) while at the same time being able to change focus among tasks (attentional resource allocation). For example, people who are interrupted by a phone call while reading must be able to keep in mind the memory of what they were reading just before talking on the phone. Once the phone call is over, they should be able to return to the last sentence read and continue reading. The investigators used functional magnetic resonance imaging (fMRI), which measures changes in blood flow to the brain, to view the brains of volunteers while they performed branching tasks. When a particular part of the brain is being used, there is an increase in blood flow to that area. The increase in blood flow means that there is an increase in the amount of oxygen-carrying hemoglobin in the blood. fMRI can measure the presence (or absence) of oxygenated hemoglobin and use that information to create an image of the brain at work on a screen. The image of the brain shows activation in the areas receiving increased blood flow. The region of the brain that is involved in multitasking is called the fronto-polar prefrontal cortex (FPPC).

Tasks performed by the volunteers involved exercises to test working memory, attentional focus, and a combination of the two. All of the subjects, who were healthy, normal volunteers, participated in all of the task groups. The task groups consisted of a control task, a delayed-response task, a dual-task, and a branching conditions task. Dual-task involves changing focus between alternative goals successively. The investigators predicted that subject performance on the individual delayed-response task and dual-task conditions would not activate the FPPC. They did predict that the branching task which involves problem solving and planning would stimulate activity in the FPPC. According to the FMRI data, their predictions were correct. The FPPC was

activated only during those tasks that involved an interaction between working memory and attentional focus decisions. The FPPC is the region of the brain that controls complex problem solving and is especially well developed in humans as compared to other primates. The study showed that the FPPC selectively mediates the human ability to multi-task. The NINDS is the nation's premier supporter of research on the brain and nervous system. It is part of the National Institutes of Health located in Bethesda, Maryland, and will celebrate its 50th anniversary in the year 2000.

*Koechlin, E., Basso, G., Pietrini, P., Panzer, S., Grafman, J. "Exploring the role of the anterior prefrontal cortex in human cognition." *Nature*, Vol. 399 (6732), May 13, 1999, pp. 148-151.

Originally prepared by Marcia Vital and Paul Girolami, NINDS Office of [Communications and Public Liaison](#).

Multitasking Makes You Stupid: Studies Show Pitfalls of Doing Too Much at Once

Wall Street Journal; New York, N.Y.; Feb 27, 2003; By Sue Shellenbarger;

Edition: Eastern edition

Column Name: WORK & FAMILY

Start Page: D1

ISSN: 00999660

Abstract:

Managing two mental tasks at once reduces the brainpower available for either task, according to a study published in the journal *NeuroImage*. Marcel Just of Carnegie Mellon University asked subjects to listen to sentences while comparing two rotating objects. Even though these activities engage two different parts of the brain, the resources available for processing visual input dropped 29% if the subject was trying to listen at the same time. The brain activation for listening dropped 53% if the person was trying to process visual input at the same time. People who are multitasking too much experience various warning signs; short-term memory problems can be one. Intense multitasking can induce a stress response, an adrenaline rush that when prolonged can damage cells that form new memory, Dr. [David Meyer] says. Other red flags are changes in your ability to concentrate or gaps in your attentiveness. Some kinds of multitasking just don't work very well. If the tasks require the same parts of the brain, such as two assignments that both draw on language skills, "it's going to be extremely hard to succeed efficiently," Dr. Meyer says. Listening for a child playing in the next room while talking to your boss by phone, for instance, creates conflicting auditory-processing demands.

Full Text:

Copyright Dow Jones & Company Inc Feb 27, 2003

A study by Basex, a New York research firm, found that office distractions ate up 2.1 hours a day for the average worker. That adds up to \$28 billion a year in the United States alone.

Another study found that employees devoted an average of 11 minutes to a project before being distracted. Researchers Gloria Mark and Victor Gonzalez of the University of California, Irvine, found that once interrupted, it takes workers 25 minutes to return to the original task, if they return at all.

People switch activities, such as making a call, speaking with someone in their cubicle or working on a document, every three minutes on average, Mark said. Betty Lin-Fisher (for Knight Ridder Newspapers), *Houston Chronicle*, 2/27/2006)

A recent study from the Institute of Psychiatry at the University of London suggests that your IQ falls 10 points when you're fielding constant emails, text messages, and calls, the same loss you'd experience if you missed an entire night's sleep and more than double the 4-point loss you'd have after smoking marijuana. On average men fared worse than women because, researchers say, men have more difficulty multitasking. *YogaJournal*, p. 22, 12/2005

On a typical day, office workers are interrupted about seven times an hour, which adds up to 56 interruptions a day, 80% of which are considered trivial, according to time-management experts. Wendy Cole, *TIME*

Magazine, 10/11/2004

People who multitask are less efficient than those who focus on one project at a time, says a study published in the Journal of Experimental Psychology....Managing two mental tasks at once reduces the brainpower available for either task, according to a study published in the journal NeuroImage. Sue Shellenberger (from the Wall Street Journal), Star Telegram: "Multitasking Makes You Stupid, Studies Say," 12/2/2003

For the past 10 years we have studied the behavior of busy managers in nearly a dozen large companies. Our finding on managerial behavior should frighten you. Fully 90% of managers squander their time in all sorts of ineffective activities. In other words, a mere 10% of managers spend their time in a committed, purposeful, and reflective manner. Dr. Helke Bruch and Dr. Sumantra Ghoshal, Harvard Business Review, 2/2002