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THE MULTITASKING GENERATION

While the impact of multitasking gadgets was not her original focus, Ochs found it to be one of the most dramatic areas of change since she conducted a similar study 20 years ago. "I'm not certain how the children can monitor all those things at the same time, but I think it is pretty consequential for the structure of the family relationship," says Ochs, whose work on language, interaction and culture earned her a MacArthur "genius" grant.

"We also saw how difficult it was for parents to penetrate the child's universe. We have so many videotapes of parents actually backing away, retreating from kids who are absorbed by whatever they're doing."

Every generation of adults sees new technology--and the social changes it stirs--as a threat to the rightful order of things: Plato warned (correctly) that reading would be the downfall of oral tradition and memory. And every generation of teenagers embraces the freedoms and possibilities wrought by technology in ways that shock the elders: just think about what the automobile did for dating.

As for multitasking devices, social scientists and educators are just beginning to assess their impact, but the researchers already have some strong opinions. **The mental habit of dividing one's attention into many small slices has significant implications for the way young people learn, reason, socialize, do creative work and understand the world.** Although such habits may prepare kids for today's frenzied workplace, many cognitive scientists are positively alarmed by the trend. "Kids that are instant messaging while doing homework, playing games online and watching TV, I predict, aren't going to do well in the long run," says Jordan Grafman, chief of the cognitive neuroscience section at the National Institute of Neurological Disorders and Stroke (NINDS). Decades of research (not to mention common sense) indicate that the quality of one's output and depth of thought deteriorate as one attends to ever more tasks. Some are concerned about the disappearance of mental downtime to relax and reflect. Roberts notes Stanford students "can't go the few minutes between their 10 o'clock and 11 o'clock classes without talking on their cell phones. **It seems to me that there's almost a discomfort with not being stimulated--a kind of 'I can't stand the silence.'**"

YOUR BRAIN WHEN IT MULTITASKS

ALTHOUGH MANY ASPECTS OF THE networked life remain scientifically uncharted, there's substantial literature on how the brain handles multitasking. And basically, it doesn't. It may seem that a teenage girl is writing an instant message, burning a CD and telling her mother that she's doing homework--all at the same time--but what's really going on is a rapid toggling among tasks rather than simultaneous processing. "You're doing more than one thing, but you're ordering them and deciding which one to do at any one time," explains neuroscientist Grafman.

Then why can we so easily walk down the street while engrossed in a deep conversation? Why can we chop onions while watching Jeopardy? "We, along with quite a few others, have been focused on exactly this question," says Hal Pashler, psychology professor at the University of California at San Diego. It turns out that very automatic actions or what researchers call "highly practiced skills," like walking or chopping an onion, can be easily done while thinking about other things, although the decision to add an extra onion to a recipe or change the direction in which you're walking is another matter. "It seems that action planning--figuring out what I want to say in response to a person's question or which way I want to steer the car--is usually, perhaps invariably, performed sequentially" or one task at a time, says Pashler. On the other hand, producing the actions you've decided on--moving your hand on the steering wheel, speaking the words you've formulated--can be performed "in parallel with planning some other action." Similarly, many aspects of perception--looking, listening, touching--can be performed in parallel with action planning and with movement.

The switching of attention from one task to another, the toggling action, occurs in a region right behind the forehead called Brodmann's Area 10 in the brain's anterior prefrontal cortex, according to a functional magnetic resonance imaging (fMRI) study by Grafman's team. Brodmann's Area 10 is part of the frontal lobes, which "are important for maintaining long-term goals and achieving them," Grafman explains. "The most anterior part allows you to leave something when it's incomplete and return to the same place and continue from there." This gives us a "form of multitasking," he says, though it's actually sequential processing. Because the prefrontal cortex is one of the last regions of the brain to mature and one of the first to decline with aging, young children do not multitask well, and neither do most adults over 60. New fMRI studies at Toronto's Rotman Research Institute suggest that as we get older, we have more trouble "turning down background thoughts when turning to a new task," says Rotman senior scientist and assistant director Cheryl Grady. "Younger adults are better at tuning out stuff when they want to," says Grady. "I'm in my 50s, and I know that I can't work and listen to music with lyrics; it was easier when I was younger."

But the ability to multiprocess has its limits, even among young adults. **When people try to perform two or more related tasks either at the same time or alternating rapidly between them, errors go way up, and it takes far longer--often double the time or more--to get the jobs done than if they were done sequentially,** says David E. Meyer, director of the Brain, Cognition and Action Laboratory at the University of Michigan: "The toll in terms of slowdown is extremely large--amazingly so." Meyer frequently tests Gen M students in his lab, and he sees no exception for them, despite their "mystique" as master multitaskers. "The bottom line is that you can't simultaneously be thinking about your tax return and reading an essay, just as you can't talk to yourself about two things at once," he says. **"If a teenager is trying to have a conversation on an e-mail chat line while doing algebra, she'll suffer a decrease in efficiency, compared to if she just thought about algebra until she was done.** People may think otherwise, but it's a myth. With such complicated tasks [you] will never, ever be able to overcome the inherent limitations in the brain for processing information during multitasking. It just can't be, any more than the best of all humans will ever be able to run a one-minute mile."

Habitual multitasking may condition their brain to an overexcited state, making it difficult to focus even when they want to. "People lose the skill and the will to maintain concentration, and they get mental antsiness," says Meyer.

On the positive side, Gen M students tend to be extraordinarily good at finding and manipulating information. And presumably because modern childhood tilts toward visual rather than print media, they are especially skilled at analyzing visual data and images, observes Claudia Koonz, professor of history at Duke University. A growing number of college professors are using film, audio clips and PowerPoint presentations to play to their students' strengths and capture their evanescent attention. It's a powerful way to teach history, says Koonz. "I love bringing media into the classroom, to be able to go to the website for Edward R. Murrow and hear his voice as he walked with the liberators of Buchenwald." **Another adjustment to teaching Generation M: professors are assigning fewer full-length books and more excerpts and articles. (Koonz, however, was stunned when a student matter-of-factly informed her, "We don't read whole books anymore," after Koonz had assigned a 350-page volume. "And this is Duke!" she says.)**

Many students make brilliant use of media in their work, embedding audio files and video clips in their presentations, but the habit of grazing among many data streams leaves telltale signs in their writing, according to some educators. "The breadth of their knowledge and their ability to find answers has just burgeoned," says Roberts of his students at Stanford, "but my impression is that their ability to write clear, focused and extended narratives has eroded somewhat." Says Koonz: "What I find is paragraphs that make sense internally, but don't necessarily follow a line of argument."

Koonz and Turkle believe that today's students are less tolerant of ambiguity than the students they taught in the past. "They demand clarity," says Koonz. **They want identifiable good guys and bad guys, which she finds problematic in teaching complex topics** like Hutu-Tutsi history in Rwanda. She also thinks there are political implications: "Their belief in the simple answer, put together in a visual way, is, I think, dangerous." Koonz thinks this aversion to complexity is directly related to multitasking: "It's as if they have too many windows open on their hard drive. In order to have a taste for sifting through different layers of truth, you have to stay with a topic and pursue it deeply, rather than go across the surface with your toolbar." She tries to encourage her students to find a quiet spot on campus to just think, cell phone off, laptop packed away.

For all the handwringing about Generation M, technology is not really the problem. "The problem," says Hallowell, "is what you are not doing if the electronic moment grows too large"--too large for the teenager and too large for those parents who are equally tethered to their gadgets. In that case, says Hallowell, "you are not having family dinner, you are not having conversations, you are not debating whether to go out with a boy who wants to have sex on the first date, you are not going on a family ski trip or taking time just to veg. **It's not so much that the video game is going to rot your brain, it's what you are not doing that's going to rot your life.**"

Generation M has a lot to teach parents and teachers about what new technology can do. But it's up to grownups to show them what it can't do, and that there's life beyond the screen.