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## Warning: brain overload

**Scientists fear that a digital flood of 24-hour rolling news and infotainment is putting our primitive grey matter under such stress that we can no longer think wisely or empathise with others**

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Every day, just to keep up to date, that grey lump between your ears has to shovel ever bigger piles of infotainment — tottering jumbles of global-warming updates, web gossip, refugee crises, e-mails, fashion alerts, Twitters and advertisements. Now research suggests that we may have reached an historic point in human evolution, where the digital world we have created has begun to outpace our neurons' processing abilities.

The result is that our data-numbered brains increasingly say “whatever” to the world's troubles. The trauma we witness on our screens — and the indignation that it should spark — goes unprocessed as our minds seek refuge in simpler things, such as whether Su-Bo should have won *Britain's Got Talent*. But the sense of mind-lag and unease that result from info-overload may be causing significant levels of anxiety and depression.

The concerns have been raised by two newly published studies which indicate that streaming digital news may now run faster than our ability to make moral judgments. Rapid info-bursts of stabbings, suffering, eco-threat and war are consumed on a “yes-blah” level but don't make us indignant, compassionate or inspired. It seems that the quicker we know, the less we may care — and the less humane we become.

One fear is that habitual rapid media-browsing can, ironically, block our ability to develop wisdom. Researchers at the University of California, San Diego, announced recently that they had compiled compelling evidence that even the universal traits of human wisdom — empathy, compassion, altruism, tolerance and emotional stability — are hard-wired into our brains. In *Archives of General Psychiatry*, Professor Dilip Jeste says that neurons associated with those attributes seem to be sited primarily in areas of the prefrontal cortex — the slower-acting, recently evolved regions of our brain that are bypassed when the world feels stressful and our primitive survival instincts grab the controls.

So, while we are born with the capacity to grow wise, the media blitz of modern life can sideline it. “Psychosocially positive behaviours such as admiration and indignation are more work for the brain than basic emotions such as pain response,” Jeste says. “Constant bombardment by outside high-intensity stimuli is not likely to be healthy. It may prevent people from having an opportunity to digest the information, match it with culturally resonant reactions and then execute well-considered behavioural responses.”

This concern is reflected in research by scientists at the University of Southern California's Brain and Creativity Institute. Their brain-scan studies show that, while we pick up signs of other people's pain and fear in a flash, it can take significantly longer for our minds to develop socially evolved responses such as compassion. The study, published in *Proceedings of the National Academy of Sciences Early Edition*, used real-life stories to induce admiration for virtue or skill, or compassion for physical or social pain, in 13 volunteers. Brain imaging showed that the volunteers needed six to eight seconds to respond fully to stories of virtue or social pain — far longer than their brains needed to react at an unemotive level.

The study needs to be replicated, but the researchers say that it indicates how we need to take relaxing breaks from our daily data-browsing or risk becoming ethically numbed by it all.

“The rapidity of attention-requiring information, which hallmarks the digital age, might reduce the frequency

of full experience of emotions, with potentially negative consequences,” the research paper cautions. Antonio Damasio, the study’s co-author, says: “I’m worried about what is happening in the abrupt juxtapositions that you find, for example, in the news. Perhaps all we can say is, ‘not so fast’.”

Such studies raise fundamental questions about the future of our neurons. If the human mind’s information-gathering capacity is becoming obsolescent, should we expect our brains to evolve rapidly in response? Or might we develop new, calmer conventions for media consumption, rather than carry on trying to multi-task ever faster in a doomed attempt to keep pace? Some scientists are even suggesting that we must develop brain-boosting drugs and implants to bridge the grey-matter gap (see box, right).

Whichever way we respond, our information flood is about to become a dam-burst. In 2006 the world produced 161 exabytes (an exabyte is one billion billion bytes) of digital data, according to the *Columbia Journalism Review*. That is three million times the information contained in all the books ever written. By next year, the total is expected to reach 988 exabytes. Personal data-consumption is growing exponentially: while Westerners continue to watch an average of eight hours of television each week, the time that they spend online rose by 24 per cent between 2006 and 2007, according to a study by Compete, the online market researchers.

“Our poor brains are definitely suffering information overload,” says Felix Economakis, a London-based chartered psychologist who specialises in stress. “Technology is making quantum leaps, bombarding us with new things to focus on, but we have not been able to catch up and adapt. Our brains’ attention levels are finite. When everything is screaming at us, we start withdrawing so that normally nice people become unempathetic.

“The primitive fear centre in the brain, called the amygdala, operates in terms of fight or flight. Information overload makes it feel under threat and it shuts down higher brain regions that deal with empathy. You end up less likely to support others — but because you feel stressed, you want to be supported by the people around you. They are feeling stressed and withdrawn, too. Everyone is demanding support and not giving it. The irony of high-speed modern mass communication is that no one is actually communicating.”

We may be reaching the point, suggested by the cultural critics Arthur and Marilouise Kroker in their 1997 book *Digital Delirium*, where we crash into the “the law of reversal” because our brain’s self-protective reaction to information overload is to shut down: “The faster the tech, the slower the speed of thought . . . the more accelerated the culture, the slower the rate of social change . . . the quicker the digital composition, the slower the political reflection: accelerating digital effects are neutralised by decelerating special human effects.”

Earlier, in the 1970 book *Future Shock*, Alvin Toffler predicted that an avalanche of information would eventually overwhelm us.

Perhaps, however, our brains can evolve. Gary Small, the co-author of *iBrain: Surviving the Technological Alteration of the Modern Mind*, thinks that the dramatic shift in how we gather information and communicate has precipitated rapid brain development.

“Perhaps not since early man discovered how to use a tool has the human brain been affected so quickly and so dramatically,” he says. “As the brain evolves and shifts its focus towards new technological skills, it drifts away from fundamental social skills.”

Dr Small, a neuroscientist at the University of California, Los Angeles, splits humankind into two categories: digital natives (children who were born post-Apple Macintosh) and digital immigrants (oldsters who still suspect that their computers harbour incubi). Youngsters are better at snap decisions and juggling lots of sensory input; their seniors are great at reading facial expressions. “The typical immigrant’s brain was trained in completely different ways of socialising and learning, taking things step by step and addressing one task at a time,” he says.

In post-Mac children, searching the internet “appears to engage a greater extent of neural circuitry that is not activated during reading”. But even Small admits that this comes at a price: these digital natives devote markedly less time to old-fashioned fundamental social skills such as talking face-to-face with the person next door.

Professor Jeste, meanwhile, thinks that the difference in how we cope with info-deluge may come down to genes, luck and experience: "Some people may be overwhelmed by stress while others who are more resilient would respond to it with growth and development," he says.

But there may be a further emotional cost to perpetual input-shovelling – a mental state that was christened CPA (continual partial attention) by Linda Stone, a former Microsoft executive who left her post at the computer giant in 2002 to pursue philanthropic work. She warns: "We have stretched our attention bandwidth to its upper limits. We think that if technology has a lot of bandwidth then we do, too."

Habitual mental multi-tasking can come at a heavy intellectual cost, says a 2005 study by the University of London. It reports that simply being in a situation where you can text and e-mail can knock ten IQ points off your brain — an effect similar to losing a night's sleep.

The resulting uncritical media-gluttedness may echo Peter Cook's cult 1970 film *The Rise and Rise of Michael Rimmer*, in which people become so bombarded with spin, broadcasts and polls that they eventually shrug "whatever", leaving the politicians to assume supreme power.

This effect already seems to occur with health advice. A recent government survey on food-buying shows that while we are given more information than ever about healthy eating, our consumption of fresh food has fallen. Catherine Collins, of the British Dietetic Association, says that info-overload is often to blame: "We are so informed that we can't be bothered."

The mounting challenge for our brains is to keep adequately informed without overload. As the Brain and Creativity Institute research suggests, building "firebreaks" into our consumption may help. Economakis, who has a new baby in the family, says he is working to put limits on his digital world. "Either you control your technology or it will control you," he says. "If you don't say that your communications devices are for work or for family emergencies only, they can easily take over your life.

"I suggest that you switch on the e-mail only twice a day and don't watch news constantly for sensation-seeking rather than for gaining information. These things can become addictive.

"You should make certain days, and times such as family meals, sacred. You have to plan these things for now. The patients I see think that first they will get all their work communications out of the way, then they will start living. But they never get to start living."

### **Faster brains?**

"We have reached our maximum information processing capacity," say researchers at BT Laboratories, of the human brain. It's a bandwidth problem, they explain: to boost our processing power we would have to go broadband. The axons (nerve fibres) would have to be wider to speed their signalling rate. This would demand much more insulation and a better blood supply, which would take up extra skull space, leaving less room for more axons.

**Singularity** is the term created to define the point at which machine intelligence surpasses that of human beings. Nasa and Google are funding a new institution, Singularity University, to explore this future. Salim Ismail, one of its leaders, says that we should re-engineer the human brain with computer-style upgrades. "The current system is flawed," he says. "We need computer chips monitoring our neural networks. Evolution isn't going to do this for us, so technology must do it."

**Drugs** that promise to boost brainpower are already being taken by 20 per cent of scientists, according to a survey by the science journal *Nature* last year. Most respondents said that they indulged to "improve concentration" and most did so on a daily or weekly basis. Popular substances included Ritalin, normally prescribed for hyperactive children, and Modafinil, which is meant to treat fatigue and jet lag.

**Pierre Balthazard** is an Arizona State University management professor who is scanning successful corporate leaders' brains to identify brain patterns, then training managers to replicate them in the belief that this will change the architecture of their grey matter. "We are coming up with the genome of the leader," he says. But will science be able to build in enhanced moral circuitry?

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