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The Runaway Brain

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Bombard the brain with technology, info-overload and multi-tasking and this vital organ may react very badly indeed. Wendy Tuohy gets inside the modern head

A little boy in English class is straining to stay tuned to his teacher as she ramps up Hollywood's film version of Hamlet, starring Laurence Olivier. Up comes the 1948 classic, and there is Hamlet, agonising poetically about whether to kill the murderer Claudius.

"Come on, Prince, just DO IT," begs the boy, already exasperated by the wait. Suddenly, his hero Arnold Schwarzenegger pops into the scene, dressed as Hamlet and chomping on a fat cigar. "Hey, Claudius! You killed my father! BIG mistake," says Arnie-Hamlet, kicking him through a mighty stained-glass wall.

"Something is rotten in the State of Denmark, and Hamlet is taking out the trash," booms the cheesy voice-over, as sparks fly in Elsinore castle.

For Matthew Ricketson, journalist and academic, this scene from 1993's Last Action Hero neatly sums up the shrinking state of our concentration spans and our addiction to non-stop action in everything we do. "There are not going to be any more five acts where the hero contemplates whether to kill somebody or not; we're just going to have Arnie," he says.

At home, Ricketson's own teenage children watch The Secret Life Of Us and Boston Public on different channels at the same time, happily following both. And at work, the media commentator and head of journalism at the Royal Melbourne Institute of Technology says he works hard to grab and hold the web-surfing, text-messaging, remote-loving, e-mailing, interactive, DVD-literate generation Y.

"Whenever technology is introduced, inevitably you gain and you lose something," Ricketson says. "The danger with the rapid intake of information and quick switching between various media forms is that you lose the deep reading habit, where you read something and actually move into a different mental state where it is quite meditative.

"It is as if you are building up one bicep to Schwarzenegger proportions while the other looks like the 98 pound weakling getting sand kicked in his face."

Could it be that our multi-tasking jobs and multi-dimensional entertainment habits have just made us restless? Or are we actually changing the way our brains attend, reconditioning them to shorter blasts of work while the skill of deeper focus slides?

Neurological research into the effects of the jerky new-millennium lifestyle is difficult, since non-invasive observation methods give a limited picture of the brain's finer functions. But scientists, such as Dr Jason Mattingley, a senior research fellow in the school of behavioural science at Melbourne University, are discovering we do pay a mental cost when we ask too much of our brains at once.

Mattingley studies the area of human attention, and says the amount we are asking our brains to process simultaneously is one cause for its perceived erosion. "Psychologists and other scientists have grappled for a long time with what attention actually is, and there is an understanding that it is the ability to filter out anything distracting or irrelevant in the environment, and to focus on what is relevant.

"The brain is processing a lot more information than we are aware of - our senses are being bombarded all the time - and the mechanism of attention does the filtering," Mattingley says.

While we are able to manage a certain amount of multi-tasking (doing "highly overlearned" brain activities such as driving and talking simultaneously), he has found there is a "switch cost", or trigger for

errors, that occurs in the time it takes to move between many tasks.

This switch cost causes mistakes, and is the reason people in demanding, multi-dimensional jobs, such as air traffic control, fatigue quickly and work only in short bursts. The rest of us suffer it, too. "We find costs when tasks require a person to switch between different sources of information. That is another reason people might think they are not able to keep their attention on one thing or are highly distractable.

"Most of us need to switch rapidly between tasks or sources of information, and there is a specific mental set that goes with that," Mattingley says.

"When we switch, there's an intervening period from one activity to the next in which people tend to make errors in performance - they may continue to respond to the old task rather than the new. We are supposed to be multi-tasking in our everyday lives but that has an impact."

Mattingley says the brain struggles to process competing sources of information and though cable television, in particular, has added changing information boxes and ticker tape messages to its screens, we are unable to remember all the details of more than one source.

This was exemplified when, in the wake of the television marathon that started on September 11, talk-back radio callers complained of the difficulty of watching the CNN feed with all the activity the network crammed on the screen.

So is over-stimulation contributing to attention fatigue? There is plenty of empirical evidence that the amount of time we are likely, or able, to stay mentally glued to activities is getting shorter. For example, the rule of thumb for drama writers, such as Bevan Lee, head of creative development at Channel 7 and creator of *All Saints* and *Always Greener*, traditionally allowed the first 15 minutes in an hour-long program to build a "dramatic set-up" or story hook. In the past five years this has contracted by two thirds, to less than five minutes.

"The scene we put before the opening credits has to be really grabbing, we have to give the audience a good enough hook to lure them over [the credits]. Somehow, they have this fractured attention span, and like to be barraged," says Lee.

No wonder, when we can log on and watch American "webisodes" of six to 10 minutes which *The New York Times* recently defined as "sitcoms for people with really short attention spans".

Meanwhile, on the advertising side, John Neal, who heads up Carat Australia in Melbourne, part of the world's largest independent media agency, has seen TV ads drop from 60 seconds to as short as 10 seconds. He says if viewers take in five seconds in 30, it's a win. "If they remember anything the next day, even better," Neal says.

Even the AFL has been trialling shorter quarters in games, down from 20 minutes to 17.5, after audience research commissioned by the league showed sections of the crowd were getting bored.

Finding the audience for advertisers is getting harder as technology-diverse lifestyles fragment the market. Keeping people focused on your ad alone is almost impossible when, as Carat research has found, audiences commonly have up to four forms of electronic media going at the same time.

Depression, anxiety and stress could also contribute to a reduced ability to stay tuned. Mike Salzberg, a consultant neuro-psychiatrist and senior lecturer at Melbourne University, says the latest research into the effects of stress on the brain shows that, if prolonged or occurring at vulnerable stages in early childhood, it could damage mental function. He cites the work of the Stanford University scientist Robert Sapolsky, who has shown that the stress-related hormone cortisol, if sustained at high levels, affects the hippocampi which are structures present on both sides of the brain and are involved in memory and attention.

"It's a new aspect to the old stress story," Salzberg says. "If people are overloaded and stressed because of their fragmented lifestyle or a sense of lack of control, they may be stressed to the point of persistently elevated cortisol. It has been shown in a range of animal and some human studies that persistently elevated cortisol has a damaging effect on the hippocampus."

Salzberg says patients with chronic depression and post-traumatic stress disorder also have been reported to have smaller hippocampi. The good news is cells in the hippocampi, even in adults, can regenerate.

All the brain-numbing stress is partly a result of the raised expectations we have of our brains, according to Dr Marie O'Shea, senior neuropsychologist at the Austin and Repatriation Medical Centre in Melbourne.

"Our lives revolve now around computers and technology, where we get a huge amount of information immediately that [once] would have taken a lot longer," O'Shea says. "We have transferred those

expectations into other areas of our lives as well." The expectation that things should happen fast, and the habit of being hooked on mental action, has made us highlights junkies.

"At a point, people become bored. Their expectation of what they want in order to be stimulated rises, like at a football match, people want action now. They're used to seeing the replays and want it all very quickly. Capacity [for patient attention] has been reduced because we want everything now," O'Shea says.

The great cinema director Stanley Kubrick once saw a coffee advertisement in which a woman discovers her long-lost son by knocking on his door to borrow a jar. He immediately sent the ad's producer a note saying, "I could have told that story by cutting the following lines..."

Producer and actor Sydney Pollack told this story at a recent Australian screen conference to illustrate Kubrick's perfectionism, but Simon Britton, the head of the Australian Film Television and Radio School (Melbourne), sees it as a good illustration of the heightened pressure on anyone attempting to get the public's attention. He says the rule is clear-cut: to work, a movie must now have a strong plot climax in the first 19 minutes "because that's when the attention starts to drift".

According to David Castran, head of media research company Audience Development Australia, television makers now have only six minutes to capture our attention. Even then it is very likely we will be watching more than one show, and even grazing between segments, constructing our own program.

He has found people commonly watch snippets of several shows and rarely finish watching one. Such restless viewing habits make it harder to create a "relationship" with viewers. Ironically, it has been the profusion of highly segmented lifestyle shows that has allowed us to do this.

"We've found viewers don't just channel surf to see what's on," says Castran. "They sample bits and pieces of various shows and edit and construct their own segments."

Chief executive of TV ratings agency OzTam Louise McCann says viewers jump around so much that the company is pioneering a system that allows networks minute-to-minute analysis of their behaviour. Viewers are now clocked in 15-minute blocks. Says Castran, "People are there poised with their finger on the remote control. There's so much more choice, they have become inundated. They're busier and they have to make judgments quickly because of all that's coming at them... We're like an overly stimulated animal now."

The brain, of course, has not changed in the 20 years since the number of technologies we use has exploded and the pace of work and leisure activities has accelerated. But researchers, such as John Rostas, professor of medical biochemistry and executive director of the Hunter Medical Research Institute, near Newcastle, NSW, says that there are symptoms created by this hyper lifestyle.

He says the amount of mental stimuli that cause "arousal" during normal work and leisure activities has vastly increased. Arousal is the word used by psychologists to measure interest and attentiveness.

A high level of arousal - for example, the heightened state caused by multiple interesting or pleasurable stimuli - causes the body's sympathetic nervous system, driver of blood pressure and heart rate, to become active, which is also useful for performance.

"One way you can improve the learning behaviour in animals and humans is to use drugs that stimulate the sympathetic nervous system; it seems to just tone up the whole nervous system," says Rostas. But there is a point where being highly toned can tip into being highly strung.

"If we suddenly have 56 things to do today and different people are all coming in asking, 'Have you finished my task yet?', not only do you become inefficient but anxious about it," says Rostas. "There are some very good managers who can juggle 10 tasks at once and keep multiple things going, but there are other people who freak when they have to do more than one thing at once."

Marie O'Shea says there is a chance that, in future, the brain will show signs of differences caused by our lifestyle. "We are learning more about neuronal development over time; evolution will allow certain skills to develop over others, and those who have those skills in higher proportions will tend to do better than those who haven't," she says.

"It may be that in 1,000 years time, the brain is operating slightly differently because of all sorts of inputs it has been receiving - looking at screens, flashing lights. It is not unlikely to expect that over time our neuronal development may be modified by the demands we place on ourselves."

Associate professor John Watson, a neurologist and director of the neuropsychology unit at the Royal Prince Alfred Hospital and Sydney University, says we may see signs of the impact of the way we structure learning, work and leisure sooner than we think. Connections between neurones in the brain, especially the frontal lobe, continue to develop from birth to mid-teenagehood or later. Therefore, Watson says, connections that are used are reinforced and others less used may be lost.

"You could make a strong argument - but purely speculative - that we are bringing up infants and children and teenagers who are only really asked to attend to something for a few minutes at a time," says Watson. "They want, in the space of an hour, to have a hamburger, kick a ball, play Nintendo, argue with their sister, all in little grabs. They won't do any of those things for a sustained period of time, and it could have some influence on the development of the connections within their frontal lobe, and from the frontal lobe to other parts of the brain - to our detriment.

"In other words," continues Watson, "we could be moving into a generation where the very young may not know another way of doing things. They may, say, end up having each school lesson shortened from 40 minutes to 20, because they can't pay attention.

"You could raise this highly speculative concern - this is a self-fulfilling path - that so much is going on, the world's so exciting but attention spans are less, so let's serve up lots of stuff in little amounts," says Watson.

"We could make an argument that at some stage perhaps we could be interfering with the development of connection patterns in Joe Average's brain, particularly the frontal lobes, to the extent he could actually have a shorter attention span."

So what is the future for Joe Average, movie buff? He will be spared any drawn-out angst, ethical dilemmas and demanding plots if Last Action Hero is anything to go by.

"To be or not to be?" asks the muscle-bound Hamlet with his finger on a detonator. "Not to be!" he decides. And with a big bang and flash, Elsinore, his castle, is history.

USE IT OR LOSE IT

The study of the human brain's ability to re-organise itself to adapt to environments and training is called neuroplasticity. It's a hot research area. Richard Silberstein, director of the Brain Sciences Institute at Swinburne University of Technology, is examining how the brain organises itself for thinking, feeling and attention.

He says that screen-based communication and entertainment rely heavily on the element of change to keep people interested.

"Change is one of the keys to attention," Silberstein says. "There are special systems designed to respond to the unexpected and change, and people use it because they know a change of scene, background or camera angle perks the attention up. The ultimate extreme is MTV, where the changes are just mind-boggling.

"The thing that would concern me is, does that have a longer term effect on one's ability to sustain attention?"

Silberstein says the way the brain is used, and the situations it is exposed to, can influence it. "There's a lot of evidence that suggests, 'Use it or lose it' for example, and that if you engage in training, or whatever, it changes the way the brain is organised.

"For example, with piano playing, the parts of the brain that control fine finger movements get larger as the training takes hold. We know the brain can adjust itself all the time in the light of experiences it's having.

"If you expose individuals to environments where they don't have to sustain their attention for any length of time, my sense is that their ability to sustain it for any length of time may become compromised."

FIVE FASCINATING FACTS ABOUT THE BRAIN

1 Men's brains weigh more, on average, than women's brains - about 1,400g versus 1,260g. There is little evidence to suggest, however, that brain size is directly linked to intelligence.

2 The brain is the third largest human organ, after the skin (weighing on average 10,886g) and the liver (about 1,560g).

3 The left side of the brain controls speech, logic, writing and arithmetic while the right side of the brain controls imagination, art, symbols and spatial relations. In most people the left hemisphere is dominant but for left-handers, the right hemisphere is dominant.

4 The brain is composed of up to one trillion nerve cells - one hundred billion are neurons (which receive, process and transmit impulses) and the remainder are supporting cells.

5 The cocktail-party effect - the ability to hear our names above the rabble of a noisy party - is due to

the brain interpreting the sound transmitted by the ear. Because of the familiarity of our name, we are instructed by the selective mechanism of the brain that we have heard it spoken above other noises.

Sources: 1, 2: The Top 10 Of Everything 2002; 3, 5: Reader's Digest, Strange Stories, Amazing Facts

4: UXL Encyclopedia Of Science

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