

# THINK

Can you really fend off dementia with simple mental exercises? It's an idea rapidly gaining currency among scientists, writes *Roy Eccleston*.

# OR SINK





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# MAGAZINE

**Pick the odd ones out**

Doing tests like these may stave off dementia, says latest research.  
Learn how to train your brain - and get the answers - inside.



®



Alzheimer's  
Australia  
Living with dementia



# THINK OR SINK

**M**y first encounter with the cheery, bespectacled Japanese brain expert Dr Ryuta Kawashima is not a happy one. I do all he politely asks, as quickly as I can, and after a few minutes his verdict is delivered: I have a brain age of 70.

Since I'm actually a few decades younger, this is not encouraging. But it's hard to argue with Kawashima, since he's just a disembodied head bouncing across the screen of the Nintendo DS handheld computer games console. Later I share the news with the head of Alzheimer's Australia, Glenn Rees. "Well," he says gloomily, "that was better than I did."

All may not be lost. Just like a bulging belly can become a rippling six-pack and a wrinkled face can be Botoxed smooth again, so new evidence suggests the brain can also be buffed and toned despite advancing years. Nintendo's computer game is an early foray into a

vast, developing market of baby boomers fearful of losing their minds and memories to the awful, incurable Alzheimer's disease.

Kawashima's *Brain Training: How Old Is Your Brain?* game has already sold more than 5 million copies worldwide since its launch last year, including more than 35,000 in Australia since going on sale in June. With a stylus to write on the computer's screen and voice-recognition technology, the game claims to determine your "brain age" and then provide exercises to lower that score. The optimum is 20, the age at which the brain is supposed to be sharpest. Do that, claims Kawashima, and it will help ward off dementia.

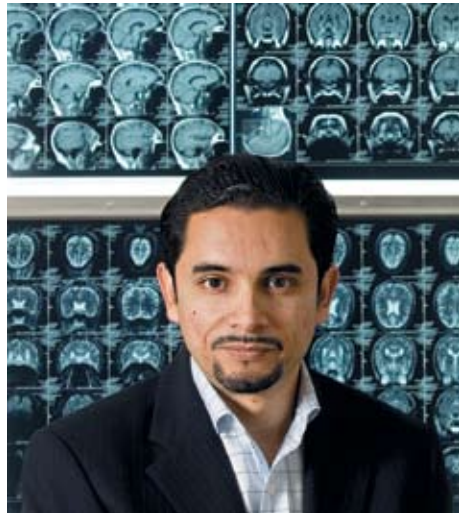
Kawashima is no invention of the Pokemon crowd at Nintendo - he's a Japanese neuroscientist who has published studies on the benefits to Alzheimer's patients of brain exercises, as well as self-help books that have sold millions. The game includes a variety of counting and memory exercises: how many words from

a list of 30 can you remember, how fast can you count the syllables in a sentence, how accurately and quickly can you do 100 simple sums? Nintendo sees the game stimulating a new market; Kawashima says it stimulates the prefrontal cortex - the bit of the brain that gives us an upright forehead, and which is linked to creativity, self-control and communication.

For the brain age check, I have to call out the colour of the words the computer flashes up. This is known as a Stroop test, and there's a trick to it. The word may say "blue" but be written in red. The correct answer is red, but your natural response is to read the word and say "blue". The computer measures not just how many you miss, but how quickly you do it. And, admittedly after a few problems recognising my voice, Dr K's program is telling me my brain is 70! Am I doomed already? Not at all, insists the real Kawashima by email. "TRAIN THE BRAIN!!" It's increasingly the cry, as around the Western world Alzheimer's looms as one of the great unsolved medical challenges for a population that is living longer - and therefore is more susceptible to degenerative brain disease.

First described by Dr Alois Alzheimer a century ago last month, there is still no cure, although there are some hopeful developments. Kawashima's own studies show big improvements in the communications and social skills of Japanese dementia patients whose brains were exercised by reading aloud or doing simple arithmetic for 20 minutes a day.

But does the "use it or lose it" strategy really work? "I think there's cautious optimism that they can make a difference," says Rees of the games, adding that Nintendo has provided the association with a donation.



Producing a bigger "brain reserve" can ward off dementia, says neuroscience researcher Dr Michael Valenzuela.

That's also the view of associate professor Michael Woodward, medical director of aged care at the Heidelberg Repatriation Hospital in Melbourne and a national expert on the disease: "I think anything that provides a mental stimulus to the brain can help form new connections between the brain cells - synapses - and there's increasing evidence that the more synapses we have, the more protection we have against Alzheimer's."

There are plenty who hope to make money from the idea. Nintendo also sells *Big Brain Academy*, Sony has developed *PQ: Practical Intelligence Quotient*, and Posit Science in the United States has the *Brain Fitness Program*. There's also a growing number of internet websites where, for a fee, members can use computer-based exercises claimed to supercharge their brain cells. There's Mybraintrainer.com, Happy-Neuron.com and Brainbuilder.com, among others. And real brain gyms

with computers instead of exercise bikes - already dubbed "neurobics" - are starting to appear in Australia.

It will be great news if it works, because dementia is a massive and growing problem, with Alzheimer's the most common form. Fatal over about eight years, it robs its victims of memory, reason and even their ability to eat for themselves. Usually a disease of older age, dementia strikes one in 15 Australians over 65 and one in four over 85. As the average lifespan rises, and more move into that older group, the 210,000 who now have dementia is expected to double by 2030.

But old age alone isn't the problem. Research also shows a surprisingly strong link between aerobic fitness and a healthy heart and a healthy brain. The high-fat Western diet and sedentary lifestyle that produces high cholesterol, high blood pressure, coronary disease, obesity and Type 2 diabetes is also believed to be contributing to more dementia. In health terms, it's the perfect storm. It means Kawashima alone can't solve the problem.

**M**EMORY IS VERY MUCH ON THE MINDS OF the 400 people who have jammed into the Eastern Suburbs Leagues Club in Sydney for a free forum headlined "Train the Brain", organised by the University of NSW and Prince of Wales Hospital. Another 200 have been turned away, and the call goes up for those with seats to give them up to anyone over 85. Not that the crowd is especially old, with many in their 50s.

Watching closely is 55-year-old Lloyd Fairhall, a keen-eyed man hoping to find an antidote to a dodgy memory. Several members of his family have had dementia - the general term for the degeneration

of the brain's cognitive functions, such as memory, attention and problem-solving.

"And my own memory's failing as well," Fairhall says. "I'll decide to do something and then forget what it was I'd decided to do. It's more minor things. I'll plan to lock a window and when I get into the room, I think, what am I here for?" But he did remember his wife had told him about the forum, and he's hoping to learn something useful. He does. Fairhall believed that nothing could ward off dementia, but some scientists are convinced that quite a lot can be done to lower your risk.

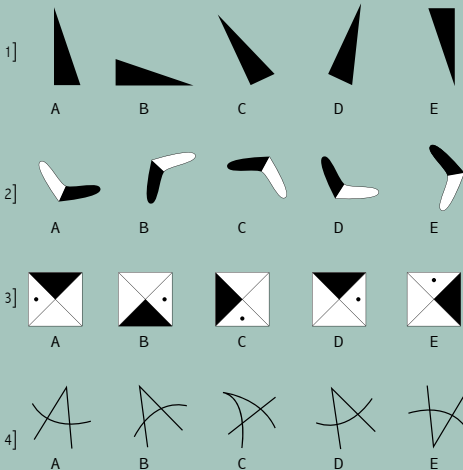
To begin, the crowd is introduced to some basics about the way their memory actually works. With three stages - encoding information, storage and retrieval - trouble can arise if any stage fails. Then there is the short-term or working memory and, when information is repeatedly used, the long-term memory. They also get a crash course in the brain's structure, with one area attracting special focus: the hippocampus, shaped like the tail of its Greek namesake, the seahorse. This small, central part of the brain is crucial to memory, transferring information from short-term to long-term files. It's like a sorting centre, moving things back and forth until they become a memory.

"It's the first to go with Alzheimer's disease," says Dr Michael Valenzuela, a neuroscience researcher whose work with University of NSW colleague Professor Perminder Sachdev earned him a prestigious Eureka Prize for medical research this year. Valenzuela, born here to Chilean parents, trained as a psychologist specialising in older people before moving into medicine and then research.

Now he tells the crowd that there's good news. Analysis of 22 earlier studies,

# THE BRAIN TRAINER QUIZ

1. If you turn your gloves inside-out and swap hands, will the palms of the gloves be against your palms or the back of your hands?
  2. Looking in the mirror, I notice that the clock on the wall behind me appears to be saying five to two. What time is it?
  3. How many minutes before noon is it if one hour ago it was twice as many past 10am?
  4. Two clocks are set at noon. However, one gains five minutes every hour, while the other loses five minutes every hour. How many hours will it take for the clocks to read the same again?
  5. If Jack is older than Kyle, and Kyle is younger than Marie, but Marie is not as old as Scott, who is the same age as Jack, who is the youngest?
  6. Which four-letter English word reads the same backwards, forwards and upside-down?
  7. There is a 10 per cent mortality rate with Major Croak's operations. If two soldiers are tracked at random from his ranks, what are the chances that both will die in his service?
  8. Which are the next three numbers in this sequence: 100, 93, 86, 79, ... ?
  9. I married my boyfriend, we had such fun; our happiness grew when we had a son. If our son's father is Roy's first boy, what relation am I, then, to Roy?
  10. If it takes six elves one hour to fill four sleighs with toys, how long will it take one elf to fill one sleigh?
- Which is the odd one out in each of the following?



**ANSWERS** 1. PALMS 2. 5 PAST 10 3. 20 4. 72 HOURS 5. KYLE 6. NOON 7. 1 IN 100  
 8. 72, 65, 58 9. DAUGHTER-IN-LAW 10. 90 MINUTES. **SHAPE ANSWERS** 1. B. (THE  
 SAME TRIANGLE IS ROTATED IN THE OTHERS. BUT B HAS BEEN FLIPPED OVER)  
 2. D. (BOOMRANGS IS BLACK ON THE LHS IN THE OTHERS) 3. D. (BLACK DOT IS TO  
 THE RIGHT OF THE BLACK TRIANGLE ON THE OTHERS) 4. C. (OTHERS ARE 1 ARC,  
 2 LINES; C IS 2 ARCS 1 LINE)

covering 29,000 people, found that boosting mental activity halved the chance of developing dementia. And, he adds, studies showed mice put into an environment rich with puzzles, activities and other mice for socialising experienced a 50 per cent cut in the chemical signs of dementia in their brains. The extra stimulation produced more brain cells and pathways for information, and maybe also slowed the march of the disease itself.

Later, over lunch, Valenzuela runs through how he and colleagues produced their stunning finding that the brain can be trained to build defences against dementia, by producing a bigger "brain reserve". The first step was to do a complex analysis of existing research to see if there was a common theme. They found that increased mental activity slashed risk by 46 per cent.

But that very general finding gave no clue as to what was going on in the minds of people who appeared to be benefiting. So the researchers took a group of older healthy people and gave half of them five weeks of memory exercises. Using a brain-scanning technique called magnetic resonance spectroscopy, they checked whether the exercises produced significant changes to the brain's chemistry.

Mostly they did not. But in the hippocampus something was going on, with increased levels of a chemical called phosphocreatine. This was doubly interesting. "First, memory problems begin in the hippocampus," says Valenzuela. "So it makes sense that practising a memory exercise will stimulate some kind of change in the memory area. Phosphocreatine was interesting because in animal studies, it was protective of neurons; it protected them from dying off under stress."



**S**O EXERCISING THE BRAIN SEEMED TO TRIGGER increased production of a protective chemical - but did it make new brain cells, or new connections? With 100 billion neurons, the number of connections in a human brain runs to about 100 trillion - which according to experts provides the brain with more pathways than there are atoms in the universe.

Alzheimer's clear-fells in this neural forest, producing deadly deposits known as "plaques" from a protein called amyloid. Creating more connections might give the brain more options in the event of Alzheimer's. It wasn't possible technically to see if the exercises made this happen in people, although it had with mice.

year study of stroke victims led by Brodaty and Sachdev, reinforced that idea. That showed that the memory centre - the hippocampus - shrank at just half the rate in older, mentally active people as those who weren't mentally stimulated. So Kawashima's game ought to help?

Maybe not. Valenzuela fears games aren't the solution because they're too narrow and likely to be short-term. He stresses the key is to have fun and do something that involves long-term social, physical and mental activities. Learn to sail, he advises, take up Tai-chi, tango dancing or learn a new language. "If you want to get a benefit, you're really going to have to sustain it for the rest of your life," he says.

**“Greater mental activity, social activity and physical activity means your chances of reducing risk are better.”** DR MICHAEL VALENZUELA

But Valenzuela thinks these new cells and pathways are being produced. And the evidence that this could help ward off dementia comes from studies showing that not everyone whose brain is attacked by Alzheimer's loses their mind or memory.

In fact, autopsies have shown that up to 30 per cent of people whose brain contained significant cell damage typical of Alzheimer's showed no obvious sign of dementia in life. How is this possible? Valenzuela thinks it's evidence that some people have a "brain reserve" that allows them to compensate for the damage. Some people have more natural brain reserve - but anyone, at any age, ought to be able to build it up with enough stimulating exercises, he thinks.

A second result, stemming from a five-

**I**T'S A DREADFUL THING TO SEE DEMENTIA AT work. This is not a disease that strikes quickly, like flicking a switch. Instead, the light dims gradually over time before flickering and fluttering, offering fewer and briefer glimpses of a mind covered by deepening shadow. For those of us forced to watch, the overwhelming feeling is of powerlessness. I recall one particularly awful moment in my own father's gradual submission to dementia: there he was, banging on the other side of the door, pleading with me to come back. And there was I, sneaking out after an hour spent walking and talking, at the hostel that had become a prison to prevent him wandering off. "Roy, Roy, come back," he called desperately through the door. I wanted to shout the same thing to the

# SO HOW DID YOU SCORE?



DEANE HUTTON (65)  
PRESENTER

Hutton fronted the *Curiosity Show* for 18 years and now appears on *The New Inventors*. "I found it so addictive that I flattened the battery," he says of playing Nintendo's

*Brain Training*. A noisy TV interfered with the results. "I ended up with a brain age in the 80s. So I switched the TV off and did it several more times and got my brain age down to the 60s, 50s and the 40s. It's a great idea - it's a real hook that gets people in, if they think they have a chance to improve on their score. It is training part of your brain ... but there's so much more in brain training such as making comparisons, judgment, being curious, asking questions."



GAVIN STEWARD (19)  
TAFE STUDENT

"When I started I got 24 - and I did it again today and I got 24 again. So that's all right. The game's different to what you expect in a normal game. It's not, like, with

characters - it's more learning and honing your skills. I normally play games with first-person shooters and RPGs (rocket propelled grenades) and stuff. So it's nothing like it - you're doing maths questions and reading aloud and stuff like that. I did the 20 calculations in 19 seconds. No, I don't have any problems with my memory. I'd like to think my brain's in good shape. But it did say to me, 'You're under 20 so take the results with a grain of salt.'"

man whose name I share.

The disease was taking him rapidly away. It had stolen his independence and was now eating away at his memory, although he still knew me back then. Just by being there, I had taken away some of his fear. And now I had to leave. I could do nothing, knowing his condition was irreversible.

The best I could hope for at that time was for a speedy progression past that stage of fear and anxiety, a time when he seemed to know something was wrong but probably no longer remembered what it was. I comforted myself with the thought he'd forget his distress, and forget I'd been there. But I'm not sure it works that way.

I'd sensed something was wrong when his landlord called me about late payments of rent. He'd simply forgotten to make them. Problems handling money are often the first signs of dementia. We moved him into new accommodation where he didn't have to worry about money, but that proved hopeless too.

He'd unscrew the light to turn it off,

having forgotten the purpose of that switch on the wall. And a CD player I bought him to play some relaxing music proved useless when he couldn't remember how to turn it on.

One weekend I took him to the beach. On the drive there, I was disconcerted to hear him say how he'd recently been talking with one of his sisters in his house, even though he'd not seen any of his family since leaving England in 1965. And then, tired by the effort of keeping him comfortable, I agreed to his suggestion he'd like a walk along the beach. Like an idiot, I blithely watched him head along the sand from the balcony of the apartment, and suddenly realised what I'd done: he'd never remember where he'd come from. So I ran after him, and eventually found him by a nearby road.

That was about eight years ago. He's long forgotten my name, or how to speak. These days he spends much of his time sleeping. He can no longer eat by himself, so on one recent visit I fed him instead of

the nurse. He hadn't lost his appetite, at least. But inside his head, the brain had been shrinking, the neurons dying, and the pathways clogged.

Might he have been helped by using his brain more, a new hobby, even by arithmetic and reading aloud? For my father, it's too late to know, but for others some doctors believe there is hope.

Neuropsychologist Nicola Gates is one of them. An absence of long-term trials proving that brain training can ward off dementia hasn't stopped her opening a brain gym in Sydney's Mosman. HeadStrong Cognitive Fitness is bankrolled by investors who see a strong market in Sydney's well-heeled but ageing suburbs, and fronted by Gates who brings the professional experience and academic training. In her late 30s, Gates has been working with brain injury victims for the past 13 years, citing that as proof the brain can rebuild.

The first clients begin their mental exercises this month. Gates insists her computer-based exercises are grounded in scientific research and backed by New York specialist Dr Elkhonon Goldberg, a pioneer of brain gyms. "You go in and complete tasks that target brain function such as processing speed, verbal fluency, and new learning capacity," she says.

Gates says until recently doctors believed the brain could not regenerate, and that advancing years meant inevitable deterioration. "Now you can increase your functioning rather than accept that with age you're going to be slower, more forgetful," she says.

"In fact, there's a lot to be said for older brains that has been missed in our general celebration of youth." All that accumulated knowledge means older people can

## ON THE BRINK

Even if your brain can bench-press a Mack truck and arm-wrestle a supercomputer, it can't stop Alzheimer's disease progressing if it starts. The only real protection is to halt the spread of dying brain cells- and a group of Melbourne scientists think they may have found a way.

"If you're a mouse [with Alzheimer's-type dementia], we can basically make you normal now," says Professor Ashley Bush. For humans it's more uncertain. But within a few months Bush and the team from the Mental Health Research Institute of Victoria should have a pretty good idea if they've hit on one of the great medical breakthroughs.

Melbourne firm Prana Biotechnology, with Bush as chief scientific adviser, is set to trial a new drug called PBT2 in people in the early stages of Alzheimer's disease in Europe after seeing sensational results in mice genetically engineered to be comparable to a human with Alzheimer's. "It was breathtaking," says Bush. "The mice get returned to absolutely normal behaviour within days, so it really looks like a detoxification. Getting them to recover ... was not really contemplated as being possible."

The mouse studies showed PBT2 can block and even reverse the disease, "but even more importantly it can dramatically improve the memory and cognitive function of the mice."

Bush's theory on the cause of Alzheimer's has been 16 years in the making but is not shared by most international experts. He and other Australian scientists working on the project argue it's the result of a failure of a protein called amyloid to properly manage key metals zinc and copper in the brain.

solve problems at a deeper level, while being less impulsive and better focused. She acknowledges Valenzuela's point that mental exercise is not enough, and says her clients will also be asked about diet and exercise, and may be directed to a dietician or local fitness gym.

But how can she be sure it will keep dementia at bay? "That's what the research consistently indicates," she insists. "The question is not whether to do it; the question is how often to do it, and how much benefit."



**"There's a lot to be said for older brains,"  
says Nicola Gates.**

Even if that is right, a sharp brain doesn't look like being enough. In the past few years, poor physical health and diet have come to be seen as direct contributors to memory trouble. There are no magic foods, although some experts recommend small amounts of alcohol - one to three drinks a day, especially red wine - fish, Vitamins E and C, folic acid, and anti-oxidants. More important is what you shouldn't eat,

and that is the same sort of high-fat menu that has produced a surge of obesity and Type 2 diabetes.

So significant are the risks from high blood pressure and cardiovascular disease that Professor Ralph Martins, director of the Centre of Excellence for Alzheimer's Disease Research and Care in Western Australia, believes physical exercise may be more beneficial than mental gymnastics.

One theory, since the brain is a voracious consumer of oxygen in the blood, is that better blood flow just makes for healthier brain cells. But Martins says it is more complicated. He is now studying four groups of people - those who increase physical exercise, those who increase mental exercise, those who do both, and those who do neither - to see which is most effective.

Some studies have shown aerobic fitness reduces the amount of shrinkage in the brain in old age. And Martins says there's evidence that increased physical activity also boosts the production of high-density lipoprotein - HDL - which mops up cholesterol from the blood. New evidence from his laboratory suggests HDL may also lower the level of the main killer of brain cells in Alzheimer's, the amyloid protein. But how much exercise, and which type, remains uncertain. Martins recommends walking 4-5km about five times a week.

CLEARLY, IT'S AN IMPRECISE business. And maybe, as argued by US neuroscientist Timothy A. Salthouse of the University of Virginia, it's more an "optimistic hope" than hard science. In March, Salthouse published a long review of the scientific papers on the subject in the journal *Perspectives on Psychological Science*. He found no convincing evidence that mentally stimulating activities prevented the brain's decline in older age. That was his professional opinion, he wrote, but "my personal view is that people should behave as if it were true". Mental exercise did no harm, was fun, and "if you can still do it, then you know you have not yet lost it".

Michael Woodward of the Heidelberg Repatriation Hospital agrees there's no absolute proof you can delay Alzheimer's. "All that you're hearing about prevention - this mental and physical activity - at this stage has not been tested," he says. "It's all just associations, so you can't be sure it's preventive. It's a chicken-and-egg phenomenon: is it because people who are prone to Alzheimer's are less likely to be physically or mentally active, or is it because people who are physically or mentally active are preventing Alzheimer's? We don't know the answer."

Still, he says playing more mentally stimulating games makes sense. "Games like the Nintendo do

increase activity in a wide area of the brain, that probably increases synapses, and increased numbers of synapses probably protect you against the amyloid and other causes of Alzheimer's."

That's gratifying, since Kawashima has been working me hard, counting how many syllables I read each second, testing my memory of lists of words and numbers, and demanding I draw pictures of koalas and kangaroos on the screen. "What wonderful results!" his bouncing head tells me after a particularly speedy bout of simple maths calculations. "I may start to cry here!" He tells me my brain age has come steadily down, after that rocky start, to below 40. Good, but nowhere near the optimal 20.

And in any case, does my better memory for lists and quicker maths add up to anything other than exactly that? From his office at Tohoku University, Kawashima is supremely confident that all this work is warding off Alzheimer's "100 per cent!" the 46-year-old tells me in an email. The evidence, he insists, is concrete.

Still, Kawashima's own approach to life seems to back the idea that the best strategy for a well-buffed brain is a broad range of activities, rather than hunching over a computer screen. Does he play Brain Training? "No," he says bluntly. "I am too busy to play games." ●

*This article was written by The Weekend Australian's staff writer Roy Eccleston.*

# Mind your Mind®

## Alzheimer's Australia's dementia risk reduction program

In 2005, a panel of eminent geriatricians and psychogeriatricians led by Associate Professor Michael Woodward examined the national and international scientific literature to identify dementia risk reduction strategies.

Studies of large groups of people showed that those who adopted 'brain-healthy' lifestyles at mid-life may have a reduced risk of developing dementia.

**Mind your Mind®** aims to encourage people to adopt healthy lifestyle habits that may protect against decline in thinking and memory abilities as they age.

The simple brain-healthy habits in the program can improve your health and lower your risk of heart disease, stroke, diabetes – and dementia.

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### **Mind your Body**

Exercise regularly – your brain will love it.

### **Mind your Diet**

A balanced diet promotes brain health.

### **Mind your Social Life**

An active social life is good for the brain.

### **Mind your Health Checks**

Regular health checks are important for brain health.

### **Mind your Habits**

Stop smoking and don't abuse alcohol.

### **Mind your Head**

Wear a helmet when appropriate.

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### **What is dementia?**

Dementia is a general term to describe problems with progressive changes in memory and thinking. Alzheimer's disease is the most common type of dementia.

Dementia can happen to anybody, but it becomes more common over the age of 65, and especially over the age of 75.

Early signs may not be obvious – only a doctor or specialist can properly diagnose dementia.

Alzheimer's Australia gratefully acknowledges the support of The Australian News Ltd.

For more information:

[www.alzheimers.org.au](http://www.alzheimers.org.au)

National Dementia Helpline 1800 100 500







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