

SHORT SCIENCE

Early testing for breast cancer may prolong life

Starting breast cancer screening as early as age 25 may help women who carry a genetic mutation linked to a higher risk of cancer live longer, according to a US study. Researchers, whose findings were reported in the journal *Cancer*, looked at which breast cancer screenings – mammogram or magnetic resonance imaging – were effective in women who carry the gene mutations BRCA1 and BRCA2, known to increase the risk of breast and ovarian cancer. Compared to no screening at all, annual screening starting at age 25 extended life by 1.3 to 1.8 years. Reuters

Scientists find host of novel viruses in sewage

Scientists have found that raw sewage has more viruses than previous estimates, according to *Science Daily*. Researchers from the University of Pittsburgh, Washington University in St. Louis, and the University of Barcelona found that raw sewage may be home to thousands of undiscovered viruses. In the report published in online journal mBio, the team detected genetic signatures from 234 known viruses that represented 26 different virus families in sewage samples from North America, Europe and Africa. This makes raw sewage home to the most diverse collection of viruses on earth. But the majority of viruses are those that have not been detected or described before, and researchers are now decoding and naming them.



Virus-rich sewage spills into the Yellow River in northwest China.

Mosquitoes use heat, smell to hunt for humans

Female mosquitoes hunt for human hosts by following the carbon dioxide they exhale and the odours their skin gives off, according to two entomologists based at the University of California, Riverside. According to *Science Daily*, Ring Carde, an entomology professor, and Swedish researcher Teun Dekker were studying female *Aedes aegypti* – the mosquitoes that spread dengue and yellow fever – when they made the discovery. The findings are expected to help doctors and aid workers develop more effective traps to catch the disease-carrying insects.

SOCIAL PSYCHOLOGY

THE RISE OF MEDIOCRE TYRANTS

Low-status employees drunk on power can be just as abusive as high-status grey suits, studies show, and may be found in work-crazed cities like Hong Kong

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Everyone knows the type: passive-aggressive, conniving, petty. Impotent kings of their own little fiefdoms, whether they're immigration officers determined to make your life miserable, security guards on a power trip or sadistic low-level supervisors.

Now it's scientific fact: It's not the big bosses in the corner office, but the mediocre tyrants with a taste for influence, who like to wield their power over others.

"The notion that absolute power corrupts absolutely is too simple," said University of Southern California researcher Nathanael Fast, one of the authors of "The destructive nature of power without status", soon to be published in the *Journal of Experimental Social Psychology*.

**So when they have low-status work, they are likely to have low self-esteem. When they are given power, they are more likely to abuse it**

LARRY FARH JIING-LIH, PROFESSOR

"People often assume that power and status are the same thing, but as soon as you realise they are two distinct variables, it allows you to make some new predictions."

The study runs on the premise that lacking status makes people feel disrespected and triggers an over-compensation to boost their self-worth. Having power, meanwhile, liberates people to pursue their aims. Put them together and you get pent-up chumps with the motive and the means to degrade others.

Fast, along with Nir Halevy of Stanford University and Adam Galinsky of Northwestern University, tested this by pairing up 213 undergraduates with high status ("idea producer") and low status ("worker") roles in a fictitious organisation. They were told that other students admired and respected the former role, and looked down on the latter.

Each participant then controlled the other's fate in qualifying for a draw for US\$50. They could make them perform tasks ranging from the benign ("jump up and down 10 times on one leg") to the belittling ("say 'I am filthy' five times") in order to

qualify. One group was told their partner had to do whatever they told them if they wanted to qualify for the money, thus giving them high power. The other group could also make their colleague jump through the hoops, but their partner could remove their name from the raffle if they disliked the tasks.

Eventually the low-status, high-power people were nearly twice as likely to choose demeaning chores than neutral ones.

But do the results hold up in Hong Kong, a city infamous for its obsession with work and traditionally rigid hierarchies?

Power distance – the extent to which subordinates perceive the chasm in equality between them and their superiors – is well known to be high in Hong Kong and even higher than the East Asian average.

The concept was pioneered by Dutch psychologist Geert Hofstede in the 1980s and the implication is that where power distance is high, people see each other as less equal, and that can justify abuse of influence towards others. Even people holding low-level yet powerful positions will perceive an inflated sense of worth over others below them.

"It's the arrogance of power, which is the precursor to the abuse of power... Because you think you can do anything," said Gilbert Wong Yao-yee, an associate business professor specialising in Chinese management at the University of Hong Kong.

In a hierarchical culture, those in power know those below can't do anything about abuse, and those being degraded are willing to endorse their own suffering. "It breeds a culture of acceptance," he said.

On top of that, this city is notorious for putting a high social value on work. The problem is that when self-worth is exclusively derived from employment, people cling insecurely to status, opening up the potential for abuse of power.

Indeed, Hong Kong people work 48.7 hours per week (far above the International Labour Organisation's recommendation of 40 hours per week), with only 11.4 hours for personal activities, according to a survey by Community Business, a corporate

social responsibility NGO. Last year. And a recent study by consultants Towers Watson attributed to workplace pressure the fact that only 47 per cent of Hong Kong employees in mid- to large-sized firms said they were in good health, compared with 61 per cent globally.

"There's a large population in Hong Kong that derive their self-esteem from their work," said Larry Farh Jiing-lih, chair professor of management at the Hong Kong University of Science and Technology, and expert in Chinese organisations. "So when they have low-status work, they are likely to have low self-esteem. And when they are given power, they are more likely to abuse it," he said.

However, he added that the culture of professionalism, clear codes of conduct and a strong rule of law in Hong Kong served as a check and balance on blatant abuse.

It is not surprising, then, that the remedy to mediocre people's power abuse, according to Fast's study, is "showing low-status power holders with flattery".

But there a lot of other reasons why people use their power to debase others. Researchers from Hong Kong Baptist University, the University of Canberra in Australia and Brunel University in Britain showed in 2007 – perhaps to the surprise of very few people – that abusive managers were likely to have authoritarian managers above their rank who treated them unfairly.

Other studies have found that everything from narcissism to self-perceived incompetence vexes people enough to act out against their fellow humans.

"I do think that there are numerous forces serving to corrupt those with high levels of power, but there are countless people who overcome those forces and use their power wisely and effectively," Fast said.

Indeed there were high-power "workers" in the experiment on undergraduates who did not choose to humiliate their partners.

Conversely, in the real world, examples of high-power and high-status people abusing their position are both frequent and blatant. Not all are enlightened despots.

Chicago Mayor Rahm Emanuel terrifies his staff, Italian Prime Minister Silvio Berlusconi throws "bunga bunga" parties for girls half his age and Muammar Gaddafi is still being hunted for crimes against humanity.

That fits with Fast, Halevy and Galinsky's conception of power, not as leading to aggression and denigration per se, but "action facilitating".

Robert Caro, the Pulitzer-winning journalist and biographer of the famously short-tempered Lyndon Johnson, reached the same conclusion. He told *Esquire*: "Power doesn't always corrupt. What power always does is reveal. When a guy gets into a position where he doesn't have to worry anymore, then you see what he wanted to do all along."

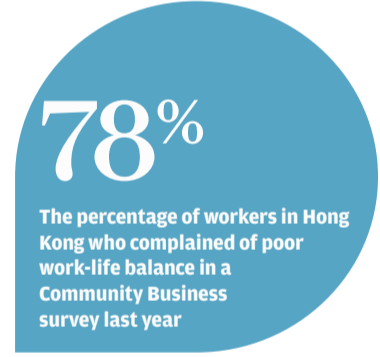
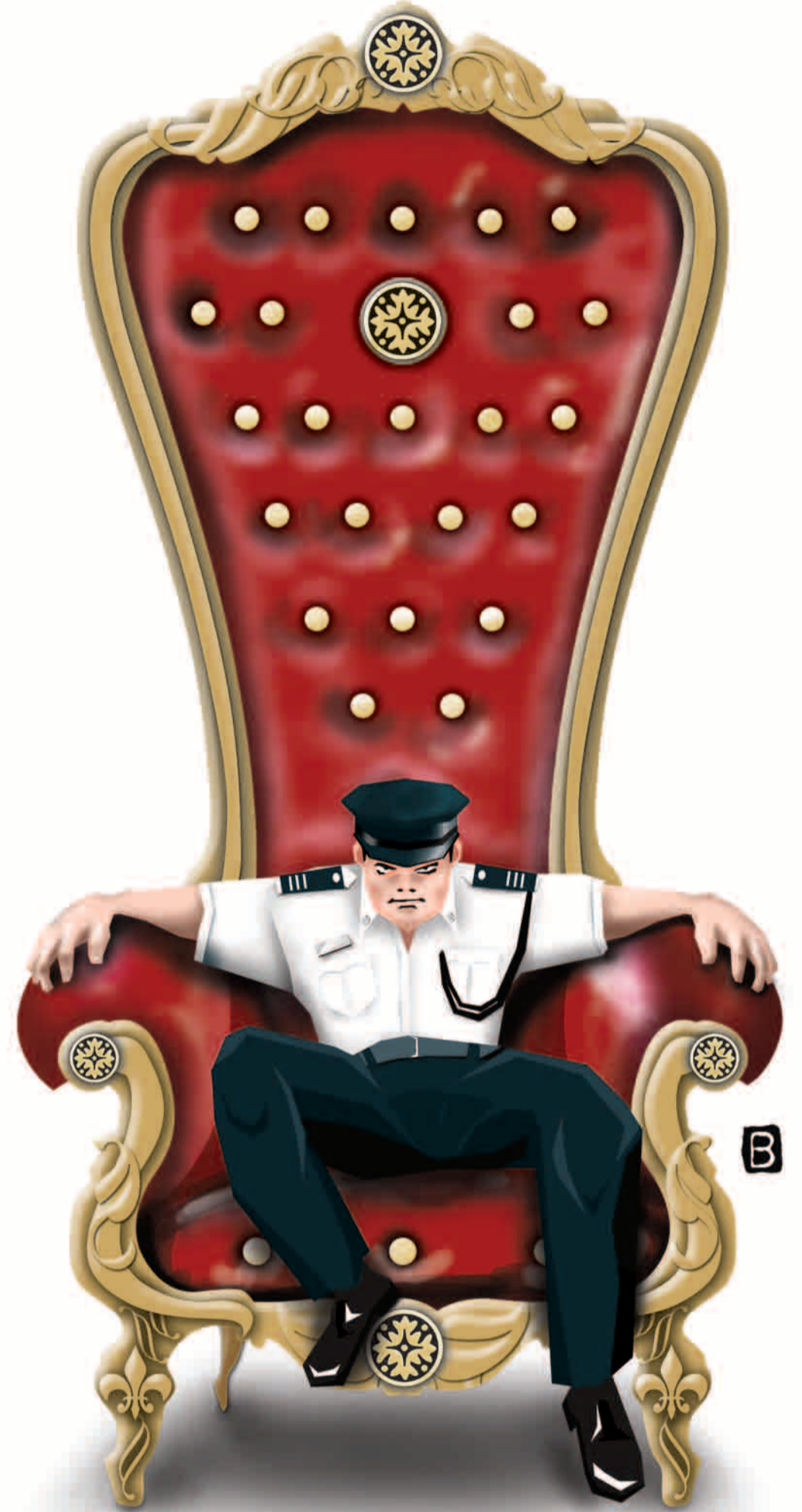
developmental reorganisation as a result of learning. Since then, there have been many studies on pitch perception showing that this ability differs according to the language a person speaks. While speakers of tonal languages like Chinese make extensive use of relative pitch perception, they also retain the ability for absolute pitch significantly better when they study music, compared with students who do not speak a tonal language. Furthermore, it does not seem to matter what musical instrument they are studying, even though different instruments produce very different physical sounds.

While the European report is titled "Neural language networks at birth", the neural networks are surely serving a much broader function than just language. Language is just the interface for many independent skills – articulating diverse sounds,

categorising sensations, naming experiences, and combining these names into syntactic patterns. Other animals also have these kinds of skills but they haven't linked them together as effectively as we have.

Ever since life began, the forces of evolution have been "tinkering" with our bodies, to use a metaphor made famous by Nobel laureate for medicine Francois Jacob. Nature has endowed us with a brain that can learn complex symbolic systems like language, music and mathematics – systems that have been created and enriched by millennia of human culture. Although we are born to learn, we can only do so with the stimulation and nurturing that culture provides. Nature and nurture are therefore constantly interacting, and inextricably intertwined.

William Wang, a linguist, is the Wei Lun Research Professor at the electronic engineering department of the Chinese University of Hong Kong



SCIENCE FOCUS WILLIAM WANG

Language sets the tone for brain's circuitry

Infants are born with the general potential to learn any tongue, but the one they end up using will play a major part in shaping their neural pathways

A team of scientists from Milan and Leipzig succeeded in imaging the brains of two-day-old infants. They report that although the brain structures for language are already in place in these newborns, there are significant differences between these structures and those found in adults.

Their paper just published in the American journal *Proceedings of the National Academy of Sciences* caught my attention.

We know that the infant's brain, weighing only about 300 grams, is tiny compared with an adult's. But it grows at an astounding rate, tripling its size in the first two years of life, eventually reaching some 1,400 grams when mature. Thanks to the European research, we now know that the brain not only grows in size, but also reorganises itself in important ways to learn about the world.

Research on the brain over the past century and a half has shown that for most of us, the left hemisphere plays a more dominant role in language than the right hemisphere. Pioneering scientists in France and Germany in the 19th century identified regions for language production and comprehension, and for reading. All these regions are in the left hemisphere.

With today's powerful methods of brain imaging, we now know that language goes much deeper than

the regions on the brain's surface observed by the early pioneers. Language is much more a whole-brain activity, involving many neural circuits operating deep below the cortex. The European research makes full use of the latest imaging technology in this infant study.

How neural language circuits eventually form depends critically on the nature of the language they support. For instance, the brain of someone who grows up speaking Chinese is surely different from the one of an English-only speaker since the auditory circuits must distinguish word tones and the visual circuits must read Chinese writing. Shaping the brain for a particular language comes later than the general ability for language. Initially the infant must come prepared to learn any language – Cantonese if born in Hong Kong, and English if born in London.

In comparing infant brains with those of adults, the European scientists found that basic structures

**We now know that language goes much deeper than the regions on the brain's surface**

are all already in place at the age of two days.

There are two observations about reorganisation that are especially interesting. One is that while the infant's brain has excellent connections across the hemispheres, the connections within each hemisphere are relatively immature. Much of the growth in coming years will be to form circuits within hemispheres.

The other observation reported in the European study is that the hearing area in the right hemisphere is more active than in the left hemisphere.

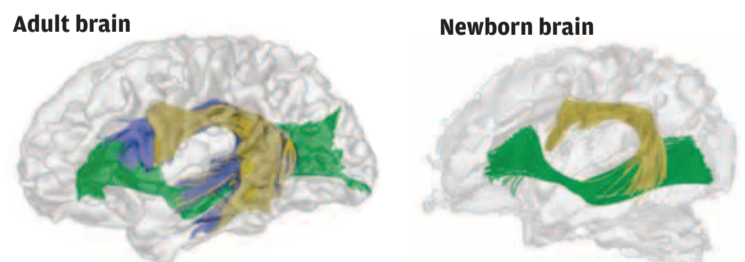
This suggests that infants process pitches in absolute physical values, in terms of hertz, rather than in relative terms, as rising or falling melodic contours. However, pitch is also a linguistic signal, used to carry intonation in all languages; as such it is primarily processed in the left hemisphere in adults.

A man asking a question and a woman asking the same question use the same intonation, even though her voice is typically much higher in pitch than his. It is the same intonation only because linguistic pitch is perceived relatively, in the same sense that the same musical melody can be sung in many different keys.

In this connection, there was an interesting paper related to this in 2001 in the journal *Developmental Psychology*. The authors showed that eight-month-old infants perceive pitch absolutely, though adults perceived the same experimental stimuli relatively. These authors interpret the difference as evidence of the brain undergoing

Crucial difference

In an adult brain, the arcuate fasciculus (in yellow) connects solidly with Broca's area (in blue), which is critical for language. In a newborn brain, this connection is yet to be made. How the neural language circuits are eventually formed depends on the nature of the language they support.



Source: Daniela Perani, PNAS

developmental reorganisation as a result of learning.

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ADDICTION

Vaccines against smoking, illicit drugs getting closer

New York Times in San Diego

Imagine a vaccine against smoking – people trying to quit would light up a cigarette and feel nothing. Or a vaccine against cocaine, one that would prevent addicts from enjoying the drug's high.

Though neither is imminent, both are on the drawing board, as are vaccines to combat other addictions. Scientists are now at work on shots that could one day release people from the grip of substance abuse.

"We view this as an alternative or better way for some people," Scripps Research Institute professor Kim Janda said. Janda has been trying for more than 25 years to create such a vaccine. Like shots against disease, these vaccines would spur the immune system to produce antibodies that would shut down the narcotic before it could take root in the body, or in the brain.

Unlike preventive vaccines, this type of injection would be administered after someone had already become addicted. For instance, cocaine addicts who had been vaccinated with one of Janda's formulations before they snorted cocaine reported feeling like they'd used "dirty coke", he said. "They felt like they were wasting their money."

It's a novel use for vaccines that has put Janda, 54, in the vanguard of addiction treatment. Because addiction is now thought to cause physical changes in the brain, doctors increasingly advocate medical solutions to the drug problem, leading to renewed interest in his work.

"It's very fashionable now," Janda said. "When we started doing this 27 years ago, it wasn't."

In July, Janda's lab made head-

lines when it announced it had made a vaccine that blunted the effects of heroin in rats. Rodents given the vaccine did not experience the pain-deadening effects of heroin and stopped helping themselves to the drug.

But the breakthrough came on the heels of a setback. A phase two clinical trial for a nicotine vaccine that was based largely on his work was declared a failure this summer when people receiving the drug quit smoking at the same rate as people receiving a placebo.

Despite many promising breakthroughs, not one of Janda's vaccines has been approved by the US Food and Drug Administration. For despite many successes in the lab the vaccines have yet to produce consistent results in human clinical trials.

"The big problem plaguing these vaccines right now is the difficulty predicting in humans how well it's going to work," Janda said.

The scientific principle behind Janda's vaccines is, as he put it, "simplicistically stupid". They introduce a small amount of the foreign substance into the blood, causing the immune system to create antibodies that will attack that substance the next time it appears.

But molecules like cocaine and nicotine are tiny – much smaller than disease molecules – so the immune system tends to ignore them. So Janda attaches a bit of the drug itself, or a synthetic version of it, to a larger protein that acts as a platform. The last part of the vaccine is an adjuvant, a chemical cocktail that attracts the immune system's notice, tricking it into making antibodies against a substance it usually wouldn't see. "The beauty of it is you're not messing with brain chemistry," Janda says