

## **Research and Findings About the Arts - 1**

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### **Making the city safer:**

From: [http://www.findarticles.com/p/articles/mi\\_m1511/is\\_5\\_21/ai\\_61692484](http://www.findarticles.com/p/articles/mi_m1511/is_5_21/ai_61692484)  
(May, 2000):

Scientists say it's not a trick--it just takes blinding speed and a couple thousand newtons

Advanced degrees in physics come in different varieties. At the Massachusetts Institute of Technology; students earn them by writing a dissertation. At the Karate Institute in midtown Manhattan, they earn them by breaking one-inch-thick pine boards. Lots of them.

Ben Paris, a fourth-degree black belt in tae kwon do, is happy to demonstrate his grasp of the scientific principles.

Read the whole article at:

<http://www.your-martial-arts-resources.com/free-budo-articles.html>

### **Research shows brain's ability to overcome pain and thirst:**

From: [http://www.eurekalert.org/pub\\_releases/2006-01/ra-rsbo12906.php](http://www.eurekalert.org/pub_releases/2006-01/ra-rsbo12906.php)  
(January 30, 2006):

Researchers at Melbourne's Howard Florey Institute have discovered how the brain prioritises pain and thirst in order to survive - a mechanism that helps elite athletes to 'push through the pain barrier'.

The Florey's Dr Michael Farrell and colleagues discovered that pain sensitivity is enhanced when people are thirsty.

The scientists also found that a part of the brain is uniquely activated when pain and thirst are experienced together, suggesting these regions may act as an integrative centre that has a special role in modifying pain senses.

Dr Farrell used PET (Positron Emission Tomography) scans to examine changes in brain activity. The 10 individuals participating in the study were given saline injections to stimulate mild thirst and thumb pressure to induce mild pain. Although the level of thumb pressure remained constant throughout the tests, as people became thirstier, they felt more pain.

Dr Farrell said the regions of the brain (the pregenual cingulate cortex and ventral orbitofrontal cortex) activated together during thirst and pain acted like a priority switch.

"Depending on internal demands being placed on the body, the brain needs to decide which demand is more important to respond to in order to survive," he said.

"Many elite athletes have an ability to balance their priority switch longer than most people so they can push through normal thresholds of pain and thirst whilst competing."

"But when the internal demands become extreme and the body's physiology is too perturbed, the brain will tell the body 'enough is enough,'" Dr Farrell said.

The brain's ability to overcome pain and thirst is witnessed in a soon-to-be released IMAX film: *Wired to Win: Surviving the Tour De France*. This film shows how the human brain allows elite athletes to compete and push themselves to a limit beyond our imagination.

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The Howard Florey Institute, with the generous support of IMAX, is holding a free special screening of the new IMAX movie, *Wired to Win* at 6:30pm on 28 February. This event is open to the public, but seats are strictly limited.

This research paper, "Unique, common and interacting cortical correlates of thirst and pain" was prepared by Michael J. Farrell (Howard Florey Institute), Gary F. Egan (Howard Florey Institute), Frank Zamarripa (Research Imaging Center, San Antonio, Texas), Robert Shade (South West Foundation for Biomedical Research, San Antonio, Texas), John Blair-West (University of Melbourne), Peter Fox (Research Imaging Center, San Antonio, Texas), and Derek A. Denton (University of Melbourne). It was published today in *Proceedings of the National Academy of Sciences*.

The Howard Florey Institute is Australia's leading brain research centre. Its scientists undertake clinical and applied research that can be developed into treatments to combat brain disorders, and new medical practices. Their discoveries will improve the lives of those directly, and indirectly, affected by brain and mind disorders in Australia, and around the world. The Florey's research areas cover a variety of brain and mind disorders including Parkinson's disease, stroke, motor neuron disease, addiction, epilepsy, multiple sclerosis, muscular dystrophy, autism and dementia.

### **Thirsty people feel more pain:**

From: <http://www.abc.net.au/news/newsitems/200602/s1559544.htm>  
(February 1, 2006):

Going without a drink can make you more sensitive to pain, a study has found.

Australian pain expert Dr Michael Farrell of the Howard Florey Institute in Melbourne and team report their findings in today's issue of the *Proceedings of the National Academy of Sciences*.

"This is another demonstration of the plasticity of pain responses," he said.

"In this particular instance a mild perturbation of electrolyte levels, which is fundamentally what gives rise to thirst ... is enough to modify the pain response."

Dr Farrell and the team studied the relationship between thirst and pain in 10 people.

The study participants had pressure applied to their thumbs to induce mild pain and were given saline injections to stimulate thirst.

The researchers used a positron emission tomography (PET) scan to measure blood flow in the brains before and after.

The results showed that people who were thirsty felt more pain.

Two regions of the brain, the pregenual cingulate and ventral orbitofrontal cortex, which were not turned on by either input alone, lit up suggesting a location where the two sensations were being integrated.

The researchers did not find that pain affected thirst levels, but Dr Farrell says this could be because the participants were not made very thirsty in the first place and any decrease would have been hard to measure.

Dr Farrell says the team had speculated there might be circuits in the brain that allow one sensation to modulate another, which is important from the point of view of survival.

"Hunger, thirst, tiredness and pain, for example, don't conveniently happen at the same time, so it's important for the body to prioritise," he said.

He says pain is accentuated because it is more important to survival than mild thirst.

"The sensation with the most immediate implications for survival is pushed to the forefront of attention," he said.

Dr Farrell says the findings suggest it could be wise for people who are about to go through a painful experience should drink more water beforehand.

He says evidence from different types of studies also support this relationship between drinking water and pain.

But could people deliberately use dehydration to maximise pain, say via torture?

"We suspect if they got dehydrated enough that the overwhelming sense of thirst would probably make pain less rather than more," he said.

Previous studies in rats have shown that mild thirst makes the animals feel more pain but severe dehydration actually dulls pain, he says.

He says this too makes sense from the point of view of survival.

"If you were very dehydrated it would pay to suppress pain because it might get in the way of your search for water," he said.

Dr Farrell says it would have been too hard on the study participants, who already spent up to three hours on the table, to test whether drinking decreased pain.

"They've got this plastic mask holding their head perfectly still and they've got both arms spread out, one of them with a hypertonic solution going into one vein and the other one getting radioactive isotopes - it would have been intolerable," he said.

He says testing whether dehydration would have dulled pain would be similarly tricky ethically.

### **Head injury may be major risk in sport fighting:**

From: British Journal of Sports Medicine, February 2006  
(March 24, 2006):

Blows to the head often leading to concussion may be the single most common ending to "no-holds-barred" sport fighting, according to a new study.

The sport -- known variously as mixed martial arts fighting, cage fighting and ultimate fighting -- is basically a blend of martial arts, wrestling and street fighting. Competitions are banned in some U.S. states, but others allow them, and pay-per-view TV has brought matches to a wide audience.

Critics call the sport barbaric, as fighters try to knock each other out with punches, elbow strikes, choke holds and body throws, to name a few maneuvers. Defenders say no-holds-barred fighting is as legitimate as other combat sports, with one argument being that boxing is more likely to cause serious head trauma.

But the new study, published in the British Journal of Sports Medicine, suggests that mixed martial arts actually poses a greater risk of concussion.

In a review of 642 televised matches, Dr. George J. Buse of the Cannon Air Force Base in Clovis, New Mexico, found that 28 percent were stopped because a fighter suffered a head impact that left him disoriented or unresponsive.

That proportion is much higher than what's been documented in other combat sports, including boxing and kickboxing, according to Buse.

The study has its limits, however. Buse viewed videotapes of mixed martial arts matches televised between 1993 and 2003, and documented how each fight ended. Though head blows accounted for the highest proportion of match stoppages, it's not clear how severely injured each fighter was.

Still, Buse writes, it's likely that the signs these fighters displayed -- altered consciousness, unsteady legs -- were the result of a concussion.

He estimates that there could have been 48 concussions per 1,000 fighters in this study -- compared with the rate of 19 per 1,000 that has been found among professional kickboxers.

Other match-ending moments included neck chokes (14 percent) and "musculoskeletal stress" from maneuvers such as joint locks (16 percent).

As mentioned, video analysis alone cannot determine the extent to which fighters were injured in any of these situations, Buse acknowledges. "However," he writes, "this study did identify salient medical issues, of which blunt head trauma may be most concerning." More studies, he concludes, should look into the long-term physical toll of the sport.

### **The balance of risk:**

From: <http://www.damninteresting.com/?p=494>  
(March 24, 2006):

Let's suppose your child wants to take a martial arts class. Being a conscientious parent, you check out the local dojos and find two good places. Both are suitable and well equipped. Both practice fighting with contact – but there's one major difference. One dojo insists on a full range of protective padding – hands, feet, chest protectors, shin guards – the whole works. The other takes a much lighter approach - hands and feet, and sometimes not even those.

To the conscientious parent, the first place is going to look much safer, right? But when you look at the injury rates of the two dojos, you notice something odd: They're about the same. The kids covered in foam padding are getting just as many bruises, scrapes, and sprains as the kids wearing almost none. What could be going on here?

What's happening is a process known as risk compensation. It's a tendency in humans to increase risky behavior proportionately as safeguards are introduced, and it's very common. So common, in fact, as to render predictions of how well any given piece of safety equipment will work almost useless.

In the instance of the mini-ninjas, those with pads are likely hitting and kicking harder and more wildly than those without, and the adults supervising them are likely to be allowing it. Why would we do such a strange thing? Dr. Gerald Wilde of Queens University in Ontario proposes a hypothesis he calls risk homeostasis. In a nutshell it proposes that human beings have a target level of risk with which they are most comfortable. When a given activity exceeds their comfort level, people will modify their behavior to reduce their risk until they are comfortable with their level of danger. So far, that's not exactly a controversial observation. But risk homeostasis proposes another half to that continuum – according to Dr. Wilde, if a given person's level of risk drops too far below their comfort level, they will again modify their behavior. This time though, they will increase their level of risk until they are once again in their target zone.

It seems an odd proposition, but Dr. Wilde and his colleagues have assembled an impressive array of data to support it. For instance, a study of Munich taxicab drivers conducted while the taxicab fleet was being changed over to ABS braking systems. The drivers were tracked by observers unaware of which kind of brakes each cab had.

Against the expectations of safety experts who recommend ABS brakes as a safety advance, the drivers with ABS brakes actually had more accidents per vehicle mile

than those without. The drivers braked more sharply, made tighter turns, drove at higher speeds, and made a number of other adjustments to their driving, all of which more than compensated for their supposedly safer cabs.

Fortunately for us, risk homeostasis does not seem to apply in all cases. Safety innovations that are invisible tend not to provoke changes in behavior – for example changing windshields to safety glass does not alter most peoples' driving behavior. The difference in the windshield is effectively invisible to the driver, and so doesn't affect the driving. The taxicab drivers, by contrast, were intimately familiar with their cabs, and the difference in braking was apparent to them. Risk compensation can also be affected by motivation. A taxicab driver has every reason to try to get from A to B faster, but someone out for a Sunday drive to see the scenery would be less likely to go quickly in response to better braking.

Unfortunately for those whose job it is to make us all safer, risk homeostasis and risk compensation are not easy to study. It is difficult to predict how people will alter their behavior in response to a given piece of safety equipment, and thereby equally difficult to figure out what to be looking at in a study. Seatbelts, for instance, have a modestly positive effect on driver and passenger safety (though somewhat less than models predicted). It's not until you look at pedestrian safety that you really begin to see where risk compensation may be having its way.

An additional complication for the already beleaguered safety engineers is that risk homeostasis is dependent not upon actual danger, but rather the perception of risk. Much of the gender and age differences in risk-taking behavior appear to stem less from differing desires for risk, and more from the individual's different evaluation of risk. Young people, and particularly young men, tend to evaluate their level of risk as much lower than older people would, even in identical situations. This implies that promoting safer behavior depends more upon altering the perceptions of the target population, rather than improving the safety of the environment– a much trickier proposition.

What it all boils down to is that the law of unintended consequences is extraordinarily applicable when talking about safety innovations. Sometimes things intended to make us safer may not make any improvement at all to our overall safety, and in rare instances they may actually make us less safe. The human tendency to take risks may trump all the efforts of the safety engineers. In the end, no one can save us from ourselves.