The voice of reason

Far from being a sign of madness, talking to yourself could be what makes you smart, says **David Robson**

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THERE I go again, talking to myself. Wherever I am, and whatever I'm doing, words bounce around my head in an incessant chatter. I am not alone in my internal babbling. Measuring the contents of people's minds is difficult, but it seems that up to 80 per cent of our mental experiences are verbal. Indeed, the extent of our interior monologue may vastly exceed the number of words we speak out loud. "On average, 70 per cent of our total verbal experience is in our head," estimates Lera Boroditsky of Stanford University in California. The sheer volume of unspoken words would suggest that language is more than just a tool for communicating with others. But what else could it be for?

One answer to that question is emerging: language helps us to think and perceive the world. Boroditsky and other researchers are finding that words bring a smorgasbord of benefits to human cognition, from abstract thinking to sensory perception. These effects may even explain why language evolved in the first place.

The idea that language guides human thinking and shapes perception has a long and turbulent history. Philosophers have toyed with it for centuries, but its reputation became tarnished before modern psychologists could begin putting flesh on its bones.

This fall from grace can be traced to the demise of a controversial hypothesis known as "linguistic relativity", put forward in the first half of the last century by Edward Sapir at Yale University and his student Benjamin Whorf. They suggested that if language really is fundamental to the way we think, then speakers of different languages should experience the world in very different ways.

Initially, the evidence for the so-called Whorfian hypothesis looked promising, with one study suggesting that Zuni Native Americans, who use the same word for yellow and orange, have more difficulty remembering whether an object is yellow or orange than English speakers. But the idea hit a brick wall in 1972 when Eleanor Rosch, now at the University of California, Berkeley, tested the principle on the Dani people of New Guinea, who have just two colour terms: light and dark. Despite this, they differentiated and remembered the hues of different objects just as effectively as English speakers (*Journal of Experimental Psychology*, vol 93, p 10).

Around this time, Noam Chomsky's theory that all languages are fundamentally the same and hard-wired in a specialist part of the brain was gaining popularity, and this seemed incompatible with the idea that words could shape the way people think. Whorf's hypothesis fell out of favour and researchers became wary of exploring whether language evolved to shape our cognition.

Recently, however, the idea has made a comeback. Studies in the late 1990s indicated that infants are better able to group objects into categories – animals versus vehicles, say – if they have already learned the category names. And research published in 2005 by Dedre Gentner at Northwestern University in Evanston, Illinois, suggested that the spatial reasoning of young children is improved by reminding them of words such as "top", "middle" and "bottom" (*Cognitive Psychology*, vol 50, p 315). Meanwhile, a few studies have described how people who lost their language skills following a stroke have struggled with tasks such as grouping and categorising objects.

Such findings suggest that language does indeed have benefits beyond ›

communication, for children at least. But is this also true for healthy adults?

Gary Lupyan of the University of Wisconsin at Madison has spent the past few years trying to find out. In one of his first studies he asked 44 adults to look at a series of images of imaginary aliens. Whether each alien was friendly or hostile was determined by certain subtle features, though participants were not told what these were. They had to guess whether each alien was friendly or hostile, and after each response they were told if they were correct or not, helping them learn the subtle cues that distinguished friend from foe – such as the presence of a ridge on the head. A quarter of the participants were told in advance that the friendly aliens were called "leebish" and the hostile ones "grecious", while another quarter were told the opposite. For the rest, the aliens remained nameless.

Lupyan found that participants who were given names for the aliens learned to identify the predators far more quickly, reaching 80 per cent accuracy in less than half the time taken by those not told the names. By the end of the test, those told the names could correctly categorise 88 per cent of aliens, compared to just 80 per cent for the rest (*Psychological Science*, vol 18, p 1077). So naming objects helps us categorise and memorise them, Lupyan concluded.

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In another experiment, Lupyan asked a different group of people to view furniture from an Ikea catalogue. Half the time they were asked to label the object – whether it was a chair or lamp, for example – while the rest of the time they had to say whether or not they liked it. He found that when asked to label items, volunteers were later less likely to recall the specific details of products, such as whether a chair had arms or not (*Journal of Experimental Psychology: General*, vol 137, p 348). That's because labelling objects helps our minds build a prototype of the typical object in the group at the expense of individual features, Lupyan says. This may not be as unhelpful as it sounds. "Memory is quite categorical, so we often don't need to remember the specific details," he adds.

Perhaps the most surprising effect of language is the way it shapes perception. According to Lupyan and others, the words you say, think and hear have a very real impact on the way you see. Gabriella Vigliocco at University College London has found, for example, that hearing verbs associated with vertical movement – such as "climb", "rise" or "drip" – affects the eye's sensitivity to such motion. She showed volunteers a display consisting of 1000 dots, each of which moved either vertically or randomly. Vigliocco found that volunteers were more likely to detect the predominant direction of motion when they heard a verb that matched it, for example "rise"

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when most of the dots were moving upwards. Conversely, they were less likely to detect the movement if the verb described the opposing motion, such as "fall" when the dots were rising (*Psychological Science*, vol 18, p 1007).

This isn't the only example of language helping perception. Hearing a letter said out loud helps people pinpoint it among a string of other letters (*Cognition*, vol 108, p 566). Not only that, but words can help us identify an obscured image, Lupyan told the Evolang conference in Utrecht, the Netherlands, earlier this year. Lupyan and Emily Ward, now at Yale University, showed volunteers a picture of an object, such as a pumpkin, in one eye and a mass of scribbles in the other eye, in a bid to mask perception of the object. Some volunteers also heard the name of the object, others heard the name of a different object, and the rest heard nothing. After 6 seconds, the object and mask disappeared and the volunteers were asked what they had seen. The subjects identified the object around 80 per cent of the time, but hearing the name of the object boosted success to 85 per cent. Conversely, those who heard the name of another object saw the hidden image only around 75 per cent of the time.

How could this be? It seems words prime the visual systems of our brain, conjuring up a mental image that makes us more sensitive to the stimulus when it is seen. This phenomenon, in which our thoughts, expectations and sensations from the other senses can feed back into the visual system and alter what we see, is known as "top-down processing".

Primed to see

It is possible that relevant sounds also feed into our vision in this way. To find out whether spoken words are more evocative than non-verbal stimuli, Lupyan invented six objects and gave each a made-up name and an artificial sound. Once his subjects had become familiar with the objects, names and sounds, he played them a recording of the object's name or its sound, and then flashed two images of the same object on the screen – one upside down, the other the correct way up. The task was simply to say which side of the screen contained the upright object.

Lupyan figured that if words are more evocative than sounds, then the subjects would be quicker at performing the task if they heard the object's name. Sure enough, this is what he found. "After just 10 minutes the name already affects the way the subjects perceive," he says. "It's a very strong effect – virtually every subject shows it."

All these experiments have caused quite a stir. "It adds lots of lovely experimental demonstrations to what had mostly been philosophical speculations," says Andy Clark, a philosopher who studies language and cognition at the University of Edinburgh, UK.

They also add to a growing body of research that may just help resuscitate the Whorfian hypothesis. For example, Boroditsky recently found that Russian speakers, who have two words for different shades of blue, really are faster at discriminating between the different shades than English speakers. The effect disappeared when they repeated a long number to themselves, as this interfered with their linguistic capacities (*Proceedings of the National Academy of Sciences*, vol 104, p 7780).

"Thinking about words might have helped our early ancestors find something tasty to eat"

Of course, Lupyan's experiments use spoken or written words rather than internal chatter. But he thinks our personal monologue has a significant, though perhaps less pronounced, effect on cognition. "It's difficult, or in many cases impossible, to manipulate inner speech experimentally," he says. "But I don't think words need to be heard out loud or seen in written form to have an impact." Given that 80 per cent of our mental life appears to be verbal, that's a profoundly important claim.

Perhaps more importantly, the experiments shed light on the selective pressures that might have shaped the evolution of language. If words can help us identify friendly and hostile aliens in the lab, they might also have helped our ancestors to learn which animals were dangerous and which not, or which berries were poisonous and which nourishing. Conjuring up mental images with a word, on the other hand, might have aided food gathering, helping early humans locate something tasty hidden in foliage, for instance. "If you're looking for a berry, you're more likely to find it quickly if you know the name for it," says Lupyan.

Of course, it is impossible to go back in time and test this idea. But a simulated hunter-gatherer task suggests it has some merit. Lupyan and Daniel Swingley of the University of Pennsylvania in Philadelphia recently asked volunteers to find boxes of Cheerios or bottles of Sprite hidden in pictures of supermarket aisles. Half the volunteers were also asked to repeat the name of the product to themselves. Sure enough, saying the names helped people to find the targets more effectively.

Lupyan goes so far as to suggest that the cognitive benefits of language kick-started its evolution. Consider the first human to have evolved a primitive capacity to label objects, only to have no one to share the information with. "The communicative benefits would be limited, but if language has a cognitive advantage as well, then it strengthens the selective pressures, allowing you to build the prerequisites without full language in place," he says. Evolution has taken such turns in the past – the precursors of wings and feathers, for example, first evolved to allow early animals to regulate their body temperature.

"It's a nice idea," says Boroditsky, "though you could never prove it one way or the other." Clark remains agnostic on whether language originated solely for the cognitive benefits, but he agrees that these almost certainly shaped the evolution of language along the way, perhaps with language and cognition "bootstrapping" each other's development until we arrived at the modern human capacity for language.

However language emerged, it seems that our inner voice changes the way we experience the world. "Language is like augmented reality – an overlay that changes how we think, reason and see," says Clark. Boroditsky believes that this is as relevant to us today as it was to early humans. "The sheer amount of information arriving down the optic nerve is far more than the brain can process consciously," she says. Language, she believes, is how the human brain focuses on the essential details. "It's like a guidebook that has been developed by thousands of people before you, who have figured out what is important for us to survive and adapt to our environment." ■

YOUR INNER CHATTERBOX

Everybody talks to themselves, but just how much time do we spend on our personal monologues? A tentative study by Russell Hurlburt at the University of Nevada, Las Vegas, suggests that the answer is "a lot". He hooked subjects up to a pair of headphones and asked them to record the form of their thoughts whenever they heard a random beep. This revealed that up to 80 per cent of their mental experiences appeared to be verbal rather than visual or emotional (*Psychological Medicine*, vol 24, p 385).

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