Dowsing Dynamics and Dopamine Neurons

Even when we think we know nothing, our brains insist that they know something - and that's what our feelings are constantly trying to tell us.

Assume that someone tells you everything about how 20 different stocks performed over 24 hours Almost at once, you'll not recall all the financial data, and so will be unable to say which stocks were best because you can't process all that information. However, if you were asked which stocks seem the best instead - an emotional decision - you would probably be able to identify all of them. According to Tilmann Betsch **(1)** the psychologist who performed this experiment, emotions "reveal a remarkable degree of sensitivity" to the actual performance of the different securities.

The investments that rose in value were associated with the most positive emotions, while the shares that went down in value triggered a vague sense of unease. These wise yet inexplicable feelings seem to be an essential part of the decision-making process.

It turns out that when a prediction proves false - for example, if you call "heads" when a coin falls "tails" up - then your dopamine neurons immediately stop firing. The experience of the resultant negative emotion means you might learn not to make that particular call again. Disappointment is always educational and experiencing it is one of the key factors that develops our personal expertise. On the other hand, if your prediction has been accurate, then we are rewarded for getting it right. And naturally enough, taking a successful major gamble when playing poker, rather than an unimportant wager, causes our neurons to learn how to make money faster. They actually find the secret to winning before the player can consciously understand and explain the solution, a crucial cognitive talent.

Deciding without thinking, works for any practised skill. In cricket a batsman elects exactly how to play the ball, before it leaves the bowler's hand. A skilled pianist can accurately strike dozens of different keys in a few brief seconds, instinctively and without thought, and can sight-read (accurately playing music not seen or studied previously). Such feats, like dowsing, usually seem simply impossible to the unskilled.

Dopamine, the single molecule that brain cells use to communicate, was discovered by accident in 1945 by neuroscientists, James Olds and Peter Milner.**(2)** As well as also controlling muscle activity and movement, Dopamine is the brain's major neurotransmitter for helping us decide between alternative choices. Apparently it tends to operate at lower levels later in the day.

Dopamine neurons seem to detect subtle patterns that we otherwise fail to notice; they assimilate all the data that we can't consciously comprehend, in effect conducting an invisible but continuous analysis of events and experiences from the world around us. Once they come up with a set of refined predictions about how our world works, they translate these forecasts into emotions.

None of this means of course that we can thoughtlessly depend on mere cellular emotions. Dopamine neurons need to be continually trained and retrained, or their

predictive accuracy declines. Trusting one's emotions requires constant vigilance and intelligent intuition is the result of deliberate practice. What Cervantes said about proverbs “They are short sentences drawn from long experience”, also applies to brain cells, but only if we use them properly.

The decisive moment: Learning from mistakes

In the early 1990s, when Gerald Tesauro was looking for a backgammon expert to compete against the TD-Gammon computer, he chose Bill Robertie, a world-class expert in three different games - chess, poker and backgammon. “The first time I competed against TD-Gammon, I was incredibly impressed”, Robertie says, “It represented a big improvement over any other computer programme I'd ever encountered, but I was still a better player.” After a while however, the software programme became a formidable opponent, by taking note of its prediction errors and learning how to play better from an expert.

For a fire-fighter caught in a fast moving forest fire, to deliberately set fires going ahead of where he is, at first seems incredibly foolish, but this pre-burnt area cannot catch fire in rapidly advancing flames, so it offers protection. The fireman cannot know if his escape fire will work - he might suffocate - but to make a new firewall out of fire itself is still a better idea than running.

This kind of thinking takes place in the prefrontal cortex, the outermost layer of the brain's frontal lobes pressed tight against the bones of the forehead. The prefrontal cortex has undergone a dramatic expansion in the human brain. **(3)** Compared with a modern human cortex, those of all other primates, even including some of our hominid ancestors, reveals that the most obvious anatomical difference is the frontal swelling. The Neanderthal’s brain was slightly larger than Homo Sapiens’, but he still had the prefrontal cortex of a chimp.**(4)** As a result, it seems likely that Neanderthals possessed very little capacity, if any at all, for rational thought - a crucial ability of the fully human brain.

Although certain sections of this brain area, such as the orbitofrontal cortex, are actually concerned with the perception of emotional states, it is the upper two-thirds of the prefrontal cortex particularly the dorsolateral prefrontal cortex (DLPFC) – that is generally regarded as the rational centre of the human brain. When you crunch numbers, deploy logic, or rely on deliberate analysis, you're using your DLPFC.

Rationality can be a difficult word to define - it has a long and convoluted intellectual history - but it's generally used to describe a particular style of thinking. Plato associated rationality with the use of logic, which he believed made humans 'think like the gods.' Today it’s often assumed that people make decisions by multiplying the probability of getting what they want by the amount of pleasure that this will bring. Reasonably done this allows us to maximize our happiness, which is what rational agents are supposed to do. Of course, the mind isn't just a rationalising machine – we don't compute utility in the supermarket or use arithmetic when kicking a football.

Simple problems are resolved by reason. If a bat and ball together cost £2.20 and the bat is £2 more than the ball, how much does the ball cost? Your immediate emotional response might be 20p, but this is wrong.**(5)** The application of reason, thought, and conscious deliberation, albeit brief, is needed to get the right answer.

Thinking about Not Thinking

When playing golf, the brain of the skilled golfer already knows what to do. It automatically computes the slope of the green, settles on the best putting angle, and decides how hard to hit the ball. Sian Beilock **(6)** found that when experienced golfers are forced to think about their putts, they hit significantly worse shots. “If we bring expert golfers into our lab, and tell them to pay attention to a particular part of their swing, they just screw up.” Beilock says. “When you are at a high level, your skills become somewhat automated. You don't need to pay attention to every step of what you’re doing”.

The part of the brain that monitors behaviour, a network centred in the prefrontal cortex, can begin to interfere with decisions normally made without thinking. It begins second-guessing the skills that have been honed through years of diligent practice. This is known as 'choking' and sadly tends to be a downward spiral. The failures build on one another, and a stressful situation is made even more worrying.

Rather than thinking about the details of stance, swing, etc, experienced golfers might focus on general aspects of the intended stroke using a cue word. For instance, instead of contemplating the precise position of the wrist or elbow, the player should think “smooth” or “balanced”. It can be demonstrated that professional golfers do better using such holistic techniques, than those who consciously try to control their strokes.

For opera singers choking is a vivid example of the havoc that can be caused by too much thought **(7)** and shows what happens when we rely on the wrong brain areas. Singers practice to achieve an even transition from one register to another, but once this smooth “passaggio” (movement of one part of the voice to another – eg from 'chest' voice to 'head' voice) is achieved, deliberate thought can interfere with the trained movements of the singer’s muscles, so that their own bodies betray them.

Rational thought can certainly backfire for dowsers in particular and, as they do not apply reason to their technique, most cannot explain what they are doing. They adopt holistic procedures, sometimes supported with things such as a Mager disc, to focus their mind and to stop random thoughts.

Reason is a powerful cognitive tool, but it's almost always dangerous to rely solely on the deliberations of the prefrontal cortex. When the rational brain hijacks the mind, people tend to make all sorts of decision-making mistakes. They hit bad golf shots, or fail to find the leak in a pipe.

Folk often ignore the wisdom of their emotions - the knowledge embedded in their dopamine neurons - and favour things they can explain. One of the problems with feelings of course is that even when they are accurate, they can still be hard to articulate. Instead of going with the option that somehow feels the best, a person might choose the option that sounds best, even if it's a very bad idea.

It's for this reason that serious dowsers tend to work alone, avoiding any influence from, or the need to justify their actions to, others.

How not to Shop

Back in the mid-1980s, Consumer Reports decided to conduct a taste test for strawberry jam. Several food experts, all of whom were trained sensory specialists, blindly sampled forty-five different jams, scoring each on 16 different characteristics, such as sweetness, fruitiness, texture and so on. The jams were then ranked.

A few years later, Timothy Wilson, a psychologist at the University of Virginia, decided to replicate this taste test with his undergraduate students.**(8)** Would the students have the same preferences as the experts? Did everybody agree on which strawberry jams tasted the best?

Wilson's experiment was simple: he took the first, eleventh, twenty-fourth, thirty-second and forty-fourth best-tasting jams, but placed some in plain jars and others in labelled well-known high profile packages. Without the benefit of the professionals' judgements, and therefore also seemingly regardless of the taste, the students chose the expensively packaged jams as tasting "best".

Dowsers can similarly persuade themselves that their reactions are true, despite being invalid because their judgement is biased.

Do we buy an attractive picture by an unknown artist that we are assured will appreciate in value, or a van Gogh for £5 million? How should we make this choice? The best strategy may be to take a good look at both paintings, then distract yourself elsewhere for a while, and then decide. This principle is behind the exhortation to "sleep on it".

This sheds light on a very common problem in everyday life. **(9)** We often make decisions on issues that are exceedingly complicated. In these situations, as when dowsing, it's probably a mistake to consciously reflect on all the options, as this inundates the prefrontal cortex. Dijksterhuis says, "Use your conscious mind to acquire all the information you need for making a decision, but don't try to analyse the information with your conscious mind. Instead, go on holiday while your unconscious mind digests it. Whatever your intuition then tells you is almost certainly going to be the best choice**.(10)** Dijksterhuis argues that this psychological principle has far-reaching consequences and can also be applied to decisions that don't involve shopping. Anyone who is constantly making difficult decisions, from dowsers to poker players, can benefit from a more emotional thought process. Provided the dowser has sufficient experience in the task - he's taken time to train his dopamine neurons - then he shouldn't dwell on consciously contemplating the alternatives. The hardest calls are those that need the most feeling.**(11)**

At first glance, this idea might be a little difficult to accept. We naturally assume that such choices require the analytical rigour of the rational brain, and a "desk exercise" to clearly establish the nature and extent of the project is clearly wise, as it focusses, or pre-programmes, the brain. When trying to decipher a complicated situation, we believe that we need to consciously reflect on our options, to carefully think through the different car models or compare all the sofas at DFS. Simple situations, on the other hand, are generally deemed suitable for emotions. You might trust your gut to choose a main course for dinner, but you wouldn't dream of letting it select your next

car. That's why the average person spends 35 hours comparing vehicle models before deciding which car to buy.. **(12)**

Deliberation without Attention

Conventional wisdom about decision-making has got it exactly backward. It is the easy problems - the mundane problems of daily life - that are best suited to the conscious brain. These simple decisions won't overwhelm the prefrontal cortex. In fact, they are so simple that they tend to trip up the emotions, which don't know how to dowse prices or play a hand of poker. If you rely solely on feelings in such situations, you make avoidable mistakes, like simple arithmetical errors.

Complex problems, on the other hand, require the processing powers of the emotional brain, the supercomputer of the mind. This doesn't mean you can just blink and know what to do - even the unconscious takes a little time to process information - but it does suggest that there's a better way to make difficult decisions. When choosing where to dig a well, or holding a hand of cards, listen to your feelings. They very likely know more than you do.

Using Both Sides of the Brain

Practice and experience helps you get better at all the things that can't be quantified. Dopamine neurons constantly generate patterns based on experience; if this, then that. After refining, the brain compares the predictions with what actually happens. If all is in accord, the dopamine neurons emit a small burst of enjoyment - but - if expectations, generated as a result of sustained refined predictions, are not met, instantly there is an awareness of mistake, and the neurons stop releasing dopamine. The brain amplifies the shock of these mistakes. Whenever something unexpected occurs that does not fit the usual pattern, within milliseconds the cortex is immediately aware.

Dopamine together with adrenalin and serotonin are the oldest neurotransmitters in the brain, shared with most mammals, and are associated with pleasure, motivation and locomotion. Dopamine also mediates addiction through its ability to reinforce pleasure. This ancient primitive chemical keeps us alive in a very basic way, the dopamine neurons produced, in the substantia nigra part of the brain are, to some extent, what makes us enjoy being alive.

The rare disease, Familial Mediterranean Fever is believed to destroy receptors in humans, and produces anhedonia, a condition resulting in the inability to feel pleasure. Dopamine stimulators include cocaine and alcohol, which are addictive due to creating exultant, sense-enhancing and liberating feelings.

Finding water, the missing keys, or what have you, grants expertise and confirmation to the dowser thanks to the dopamine neuron. Without this confirmation, serious study of (currently) unprovable matters, such as earth energies, is difficult to advance.

Rapid cellular response starts in the area of the brain having lots of dopamine neurons, the anterior cingulate cortex (ACC), and detects errors. This unique signal or error-related negativity, technically called by neural-scientists as the “Oh s**t!” circuit, is

closely connected to the thalamus - a brain area that helps direct conscious attention. So unexpected situations (a loud noise) immediately focus the individual's attention on the new and unexpected event. Nevertheless, this is a learning process, for thunder can be (mostly) ignored. As a result of new events, expectations are adjusted, and short-term impressions serve as long-term lessons (if we are willing to learn).

Seasickness usually subsides in a few hours, once dopamine neurons revise their predictions and rationalise the conflict of the unexpected motion. There has to be a resolution of the conflict 'twixt expectation and outcome. Logic can be slow but emotion is quick.

This is why practice - for anything, piano playing, golf, dowsing, singing, and so on - is essential. However, the better you become, the more practice is required to maintain and improve the standard of your skill. Nevertheless, without incorporating the experience of past mistakes into future decisions, we could be destined to repeat errors endlessly, and never become expert in anything. Consequently, minor fluctuations guide our actions. To become and remain proficient, dowsing on new (but ultimately demonstrably provable) sites is needed all the time.

The "Yes" "No" dowsing responses that the proficient dowser employs, possibly sub-consciously and unwittingly, are words like proverbs which, you will remember from the Cervantes' quotation earlier, are short and drawn from long experience.

This is not a scientific dissertation explaining how dowsing works but, if you have followed the logic using your DLPFC, now you know why we dowsers can dowse!

References

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(6) Beilock "On the Fragility of Skilled Performance : What Governs Choking under Pressure?" Journal of Experimental Psychology : General 130 (2001). Also - Beilock, Carr, MacMahon & Stakes "When Paying Attention Becomes Counterproductive : Impact of Dividend v Skill-focussed Attention on Novice and Experienced Performance of Sensorimotor Skills." *Journal of Experimental Psychology 2002*, 6-16.

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