NEWS FEATURE:

The pleasure principle

Lessons from the treatment of addiction may help to change peoples' awareness of nature.

Elisabeth Jeffries

In an unusual experiment participants lifted two vodka bottles from a shelf, one heavier than the other, but both filled with exactly the same amount of vodka. The majority preferred the heavier bottle — perceiving it as stronger, more expensive, of better quality, more elegant and more up-market. Most consumers prefer heavier containers. This is just one insight among many yielded by brand research on how we react to different product features. Cold objects rested on the hand or arm feel heavier than thermally neutral ones, and we also perceive dark objects as heavier.

We associate fizziness with pointy objects, so stars are an appropriate brand symbol for sparkling water. Citrus is associated with brighter and sharper music, and vanilla with slow, softer music. In the past decade, researchers have widened the scope of their investigations to assess the causes of many of these brand and packaging associations. They want to know when exactly principles developed in a particular test could work elsewhere or extend to other brands so that they can make predictions of consumer choice.

Neuroscience — the study of the nervous system, seeking to understand the biological basis of behaviour — is the powerful lever uncovering some of these new facts. Behind any major brand is a busy team of neuroscientists and consumer psychologists assessing how our brains respond to it. That is because consumer self-reporting is not always reliable. But there is one area very few of them will have studied, and that is the power of consumers to stop. Plenty of funds are available to analyse our consumption patterns. Few, however, have studied our inclination to conserve, because nature has no brand manager.

That is something a Californian evolutionary biologist wants to change. "We study the brain on chocolate, red wine, music and even magic, but not on the ocean or on the sound of water," says Wallace J. Nichols of the California Academy of Sciences. Nichols is the convenor of Blue Mind, a research initiative merging the fields of cognitive science and ocean exploration. An expert on turtles and a marine enthusiast, Nichols wants to know how our brain responds to the ocean. What happens when we look at it? Why do people feel better when they see the ocean? Why do they want to live on the coast? Why do surfers suffer withdrawal symptoms when away from the breakers? These are just a few questions he wants answered.

To gather momentum for the campaign and to help develop the new field, dubbed neuroconservation, Nichols draws neuroscientists with a range of specializations from across the world. It is an embryonic field, which has hardly defined its own terms of reference yet. As Nichols puts it: "Our priorities are skewed, and not much has been done. What I'm trying to do is collect the dots from research on other things surrounding the questions we need to ask that are useful to our subject". Potential research themes have ranged from the psychological reasons for the limited fish varieties eaten in the USA, to the use of surfing to help war veterans recovering from physical and psychological injuries. Curiously, many of the scientists gathered together by Nichols are from the field of addiction treatment.

Or perhaps that is not so curious. One of the objectives of the project is to draw our attention to the beauty of the ocean and the natural world, and to assess its neurological benefits. It follows, therefore, that knowledge about addictions that keep us away from nature is likely to be very useful. David Zald, Associate Professor of Psychology and Psychiatry at Vanderbilt University, Nashville, USA, has studied the relationship between the two.

The mechanism that he has investigated is the mind's capacity for temporal discounting (pleasure definitions, and reward and motivation mechanisms are others), the ability to overcome an immediate impulse in exchange for a later, bigger reward. The relevance to neuroconservation is clear. Experience shows that if people can wean themselves off the self-centred activities of alcohol, drug, tobacco or food addiction they are more likely to seek rewards from more wholesome behaviour instead.

Zald notes that temporal discounting is an important component in the development and maintenance of drug addiction. Addicts have high temporal discounting, which means they rapidly discount the value of rewards further in the distance. Researchers have identified two competing neural systems related to temporal discounting using brain imaging techniques[1]. They find that choices for delayed outcomes are related to the brain's prefrontal cortex (the executive system) whereas those for immediate outcomes are related to the limbic brain regions (that is, the impulsive system).

Animal and human imaging studies have revealed discrete circuits that mediate the three stages of the addiction cycle in the brain. Key elements involved include the ventral tegmental area (a group of neurons in the midbrain) as a focal point for the binge/intoxication stage, the extended amygdala (almond-shaped groups of nuclei in the medial temporal lobes that process memory and emotional reactions) in the withdrawal/negative affect stage and a wide network of various other elements in the preoccupation/anticipation phase. Transition to addiction involves neuroplasticity in all of these structures, eventually leading to dysregulation of various parts of the brain[2].

"We believe that the prefrontal cortex [the very front of the brain] exerts inhibitory control that allows you to remember the long-term objective and inhibit immediate urges. Drugs reduce that power and promote immediate urges through their action on what is called the reward pathway," says Howard Fields, director of the Wheeler Centre for the Neurobiology of Addiction at the University of California, San Francisco. Fields has also considered addiction in relation to potential neuroconservation research.

Identifying the addiction process in the brain has helped to suggest ways to interfere with the addiction (possibly using pharmaceuticals) and test improved prevention and treatment programmes. This is because addiction relapse often occurs

after a year, even when cognitive therapy has been used. "Using this kind of research, we can combine cognitive approaches with medical approaches. You train people to develop new incentives that will devalue the effect of, say, alcohol," explains Fields.

According to experts, addicts code and prioritize rewards. "In addiction the drug or rewarded activity is 'locked in' as a stronger incentive than other potential rewards. In such a situation it is hard to find rewards that exceed the impact of taking the drug or engaging in the behaviour. The punishment has to be great. Alternatively, the person has to be able to identify a stronger reward, or some combination of reward and penalty, to overcome the compulsion to seek or engage in the addictive behaviour," says Zald.

But he says neuroscientists still need to answer numerous questions to help addicts further. They know addicts have low temporal discounting, but are unsure of the predictive usefulness of this information. "Does temporal discounting actually predict risk for drug use initiation, does it provide a strong prediction of risk for relapse, does knowledge of temporal discounting have value in predicting what type of therapy is most likely to work for an addict?" asks Zald.

Fields believes that two main issues need to be resolved. "How and where in the brain do the drugs act to produce their 'virtual benefit' where the brain changes that encode benefit are activated, like they would be if you were hungry and had a meal. How and where in the brain do the drugs act to produce drug dependence?" Meanwhile, Zald suggests that the evidence they may find most useful is the behavioural or biological (neuroimaging/genetic) information that can be used to predict treatment success.

The parallels between holding back on another whisky or switching off a smartphone are clear, but could the research on temporal discounting in alcohol or drug dependency be usefully transposed to conservation? Zald thinks it could: "There are clear predictions that can be made from the [studies] that are likely to apply when looking at conservation. These seem like safe predictions, but they really warrant testing," he says. Conversely, Fields indicates that he is "not confident it's the same system. It's a hypothesis."

Certainly, it is difficult to see any drug trials against consumer addictions emerging any day soon to awaken our concern for nature. Instead, two potential routes are likely to emerge for neuroconservation research. One is aimed at behaviour change, and the other a medical approach focused on demonstrating the benefits of the natural world on patients. Envisaging a possible research programme, Zald suggests a behavioural approach, beginning with the development of techniques that moderate temporal discounting:

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"I would start by having people make decisions about exploiting versus taking actions to protect the ocean. I would then start looking at ways of altering decisions. To me the most critical thing is can we predict actual changes in behaviour — either short-term or more importantly long-term. Do we predict them better based on people's immediate self-report, or based on brain imaging data?" he says.

However, previous cases show that hospitals are likely to provide the first avenue for neuroconservation research. Responses to nature have already been investigated in medical research. For example, the benefits of hospital beds that face green spaces are well established. One study showed that medication dispensed by nurses in a psychiatric ward was significantly lower on days when a realistic image of a landscape was displayed[3]. Another, conducted by South Korean medical institutions, used functional magnetic resonance imaging to explore the brain activation maps from participants viewing two different types of scenery (rural and urban)[4]. Their findings suggested an inherent preference for nature-friendly living.

At the Peninsula College of Medicine at Exeter University, UK, psychologists demonstrated that good health is more prevalent the closer one lives to the coast[5]. They also indicated that the positive effects of being close to the coast may be greater among more socio-economically deprived communities. Matt White, one of the authors, explains: "our research can be used to quantify the relative marginal gain extracted from nature [in terms of quality-adjusted life years] and how that measures up against drugs".

Wallace J. Nichols plans to launch neuroconservation as a research field in 2014. New studies using neuroscientific techniques are likely to come from Exeter University and Stanford University (USA). "The question we want to answer is to what extent you can bottle nature and bring it to medical and care environments," says White. For example, could the sound of crashing waves benefit patients? The question has never been explored or scientifically measured.

Public health data sets have already been used as weapons against brands in rows between corporate responsibility campaigners and brand owners about obesity. But after years of disputes, it is evident which party has the bigger clout and budget. Medical research provides only a narrow channel for this kind of social question, which has much broader implications. Hence, its impacts could be limited.

Scientists aiming to cut a new track in this area will have to contend with claims of bias. There are, after all, several obvious assumptions behind their research. That is as true for some of the subjects of the experiments as it is for the principles that motivate the research itself. "People don't understand how we develop a system of values. Peer pressure can promote or suppress the use of drugs and is an important factor in tackling addiction. We don't have a theory broadly agreed, though, on how people develop reward systems. That's why we can't be confident observing attitudes to nature is based on the same principles as attitudes to drugs" states Fields.

Meanwhile, if we do not understand how values are created, the research itself, which implies certain value judgements, could be construed as unsound science. Conservation is a heavily loaded term, suggesting a particular political viewpoint. That means some of the questions hypothesized by scientists could be attacked, and some of the truth ethic behind the research compromised. ❐

Elisabeth Jeffries is a self-employed journalist based in London, UK.
e-mail: elisabeth.jeffries@journalist.co.uk

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