

On art, science and the brain

Healthy habits: how habits form and why they're not all bad

JANUARY 9, 2013

tags: addiction, drugs, Habitual behaviour, healthy living, magnetic resonance imaging, neuroscience, smoking

by Wellcome Trust



(<http://thinkneuroscience.wordpress.com/2013/01/07/healthy-habits-how-habits-form-and-why-theyre-not-all-bad/10042090-a-doctor-with-a-stethoscope-rejecting-the-offer-of-a/>)

Poster from anti-smoking campaign (195-)

It's the beginning of a New Year, traditionally the time for turning over a new leaf, making resolutions, and kicking bad habits. But why is it so hard to change our ways? And why do we form habits in the first place? Peter Smittenaar (<http://www.petersmittenaar.com>) is a PhD student in neuroscience at UCL and is currently working with Ray Dolan at the Wellcome Trust Centre for Neuroimaging (<http://www.fil.ion.ucl.ac.uk/>). Here he reveals why some habits are useful and how physiological research may help us tackle addiction.

Anyone who's not got round to changing a broken light bulb knows that habits are hard to break. Even when you *know* the bulb won't turn on, the experience of entering a dark room makes your arm shoot up towards the light switch. Why does our behaviour not always reflect our most up-to-

date knowledge? Our research is aimed at understanding the balance between habits and more thoughtful ways of making decisions.

Understanding habits starts with understanding how habits are formed. When you first stepped into your new house, you may have thought: "It's pretty dark in here, let's find the light switch so I can see what I've bought". This type of behaviour is *goal-directed*: you have a specific goal in mind, and consider the actions that would lead to the desired outcome. Over time this behaviour shifts from being goal-directed to habitual: you stop thinking about your desire for light and simply perform the action upon entering the room because in the past it worked out well. This is also evident in other situations that were once goal-directed but are now habitual, such as looking before you cross the road or checking your e-mail every five minutes.

As these two examples illustrate, some habits are useful whereas others are counterproductive. More often than not, however, habits receive bad press. They are associated with eating too much, smoking, drug addiction and procrastination. But imagine your life without habits. Every action would require you to think through the different courses open to you, and decide how each one might support or contradict your current goals. It would be like playing chess all day long! Habits free up brain power by taking control of our behaviour in environments that are *familiar*. The more familiar and predictable an environment, the more we can rely on habits, leaving more computational power in our brain to focus on the important things in life.

So it seems that relinquishing some behavioural control to a habit system is advantageous. At the same time, purely relying on habits would make us inflexible and unable to quickly adjust to an ever-changing environment. What we should do, then, is strike a balance between habitual and goal-directed control, such that you use either system in its most appropriate setting. For example, you shouldn't rely on your habitual system too much when you're travelling to a new country. Your habit system needs time to learn what to do, and old habits might be inappropriate in new situations.

In our research we ask how this balance is implemented in the healthy brain. We study how people's behaviour changes as we give them drugs that affect the dopamine system,¹ or as we stimulate their brains using **transcranial magnetic stimulation** (http://en.wikipedia.org/wiki/Transcranial_magnetic_stimulation). Other studies have used magnetic resonance imaging to investigate which areas of the brain might represent these two systems.²

Understanding the physiology of these systems is relevant for many disorders where these mechanisms fail, such as in addiction.³ Addiction starts off with goal-directed behaviour: the desire to find out what it's like to smoke a cigarette for instance. The drug then tricks the brain into thinking the choice was a good one, which marks the start of habit formation. From then on behaviour becomes more habitual and eventually compulsive. Understanding the balance between these systems will help us manipulate it. This could benefit drug rehabilitation, and may also help tackle other bad habits, such as overeating.

So, next time you curse your bad habits, remember too that you can use your habit system to introduce positive and helpful routines into your life. Good luck with those New Year's resolutions!

References

1. Wunderlich*, Smittenaar*, Dolan (2012) Dopamine enhances model-based over model-free choice behaviour. *Neuron* 75(3): 418-24. doi: 10.1016/j.neuron.2012.03.042 (*equal contribution)
2. Daw, Gershman, Seymour, Dayan, Dolan (2011) Model-based influences on humans' choices and striatal prediction errors. *Neuron* 69(6): 1204-15. doi: 10.1016/j.neuron.2011.02.027
3. Everitt & Robbins (2005) Neural systems of reinforcement for drug addiction: from actions to habits to compulsion. *Nature Neuroscience* 8, 1481-1489. doi: 10.1038/nn1579

For more posts from the Wellcome Trust Centre for Neuroimaging *click here* (<http://thinkneuroscience.wordpress.com/category/wellcome-trust-centre-for-neuroimaging/>).

from → Wellcome Trust Centre for Neuroimaging

No comments yet

Blog at WordPress.com.

Theme: Customized Vigilance by The Theme Foundry.

This ad is supporting your extension *Enhancements for Gmail*: [More info](#) | [Privacy Policy](#) | [Hide on this page](#)