WHAT IS A MIND?

UNIVERSITY OF CAPE TOWN

UCTMOOCs
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Week 3 Answer to Question 3

Step 4.2 Ask Mark

Ok, question 3 is this:

Question 3: why does it seem so much harder to unlearn something than it is to learn it in the first place? When faced with something you might - and I hesitate to use the word - instinctively approach it in a certain way, only to be told the "correct" way, which then feels odd and difficult at first. Or you might learn an unhealthy way of thinking, and no matter how you try to learn a new way, you keep reverting to the old, more familiar way. Is it simply that those pathways have been laid down earlier, and so are more reinforced than the new ones, or is it to do with the way that the conscious mind operates compared to the unconscious?

It seems that we're doomed this week to me having to answer each question, or at least start my answer to each question in the same way, by saying "well, it depends." There's no one answer. It depends on what sort of - in this instance, what sort of memory you're talking about. There are multiple memory systems in the brain, and they don't all operate in the same way. Certainly I understand what the questioner is asking. She's speaking about - is it a woman? Yes. She's asking, or she's speaking about what we call procedural memory.

Procedural memories are habits and skills, they're stereotyped, automatic ways of behaving that we learn quite slowly. It's hard - the saying that we use in relation to procedural memory is that it's hard to learn and hard to forget. Like, it's hard to learn how to ride a bicycle, but once you've learnt how to ride a bicycle, you can't unlearn it - or it's blooming hard to unlearn it. Once you learn how to make those good tennis strokes, once you've learned how to ski, once you learn how to play the piano, once you learn how to speak a language for that matter - it's not easy to acquire, but once you've got it, it's almost impossible to dislodge it. These are procedural memories, they're mostly motor skills, habitual ways of responding, they're deeply automatized, and the part of the brain that's involved is primarily the basal ganglia - deep subcortical ganglia in the brain, that subserve procedural memories. It's not that you can't acquire new skills, and you can't acquire new habits - as we all know, we do, but most of them are acquired fairly early on in life, and certainly, you know, you can't teach an old dog new tricks - it becomes harder and harder to undo these sorts of response patterns.

They're not the only ones that are hard to undo. There are also emotional - something called emotional learning, like for example fear conditioning. Fear conditioning is also very hard to undo. In fact, Joseph LeDoux - a great expert on fear conditioning - goes so far as to say that fear memories, once acquired, are indelible, in other words, impossible to undo. But emotional learning, like fear conditioning - and I'm referring specifically to fear conditioning here - unlike procedural learning, is not hard to learn. It's hard to forget, but not hard to learn. Here we speak of single exposure learning. You stick your finger in an electric socket once, and you get a shock, and you never forget that, and you don't ever try sticking your finger in an electric socket again. You can see why fear conditioning works that way - once you've learnt that something is to be feared, that is to say that it's noxious, it's dangerous to life and limb - it would be evolutionarily highly idiotic to say "OK, first time I nearly killed myself by sticking my finger in there. Let me see what happens the second time." You're lucky to have got away with the first time! So fear conditioning works that way - very easy to learn, very hard to forget.

There's another type of memory, which we might almost not call memory at all, but since the questioner uses the word “instinctively”, I will remind her - and all of us - that there are also memories which are not individual acquisitions. They are, as it were, memories derived from our ancestors, in the sense that the genome was shaped by experiences of our ancestors, those who survived and reproduced behaved in certain ways, those who didn't survive and therefore didn't reproduce, behaved in other ways, and those ways of behaving then fall out of the gene pool, so that our way - the default design of our brains - includes instinctive ways of behaving. Those are VERY hard to forget, in fact they're impossible to forget - you can only override them. You can override instincts, but you can never do away with them, and that's something that's terribly important for our species to remember. We are a species of animal, we have instinctual ways of behaving, and that's why there's such a gigantic gap between all the rules and laws and ideals that we invent, compared to the ways that we actually behave, because we really are quite beastly at bottom. So those are examples of memories that are hard to forget, but not all of them are hard to learn. The instincts we don't learn at all, we're born with them. The fear conditioning - emotional memories - we acquire them with one exposure and that's it. But habits and skills, they're very hard to acquire.

Now we move to other types of memory, and the extreme example here is short-term memory. Short-term memory is holding something in mind just for long enough for you to be able to use it. We also speak of working memory in this context. Very good example is holding a telephone number in mind while you dial it: 794 8321, 794 8321, 794 8321, 794 8321 - dialled. Now - boom! - it's gone. You have a conversation with a friend and they asked you what was the number that you just dialled, you don't remember because it's the first time you've ever dialled it you only needed to hold it in memory for long enough to be able to perform the action, then it's

gone. That's how short-term memory works, that's how it's meant to work. And the brain networks - which are cortical for short-term memory - they are a reverberating circuit that is temporary, and it literally dissolves after you've used it.

If you decide you need to learn this phone number, that you're going to use it again in future - although nowadays none of us do that because we just cue them into our phones and our phones remember them for us, but people of my age remember when we used to actually have to learn phone numbers - then you have to commit it to memory, and then you're committing it to another kind of memory, which is long-term memory. But it's still cortical, it's still representational, it's still pictures - images in your conscious perception. Those kinds of memories are not that, you know, they're not that easy to learn, and they are quite easy to forget. That sort of memory's pretty fallible, and it's a slow process - which we call consolidation - which has to do with using and using and using again, which makes them slowly more and more permanent, as they get more and more deeply embedded into the network of your cognitions. Carry on for long enough in that vein, eventually those will become procedures, so that you no longer even have the memory of - you don't even remember when you learned how to do that, you just know. I know my accountants number - I won't tell it to you, but I know it. It's a sad reflection of my life that my accountants number I know automatically. I don't have to think about it at all, it's just there.

So, to come back to the question, I'm afraid the answer is complicated. No, it's not true that all sorts of memories are very hard to unlearn. Some are exceedingly easy to unlearn, in fact some are a little bit too easy to unlearn for our liking. So it depends very much which sort of memory system you're talking about. But in very broad, general terms, cortical memory systems - which have to do with representations, pictures, actual memories of the experience, I was there, it felt like this - those sorts of memories are more fal - more ephemeral, more temporary. Relatively speaking, as you go from short-term working memory, into longer-term episodic memory, into semantic memory, and then you start going into subcortical systems - like the emotional memory systems, the procedural memory systems, and the instinctual systems which are deeply subcortical - those are very hard to dislodge. So, ask a complicated question, you'll get a complicated answer.