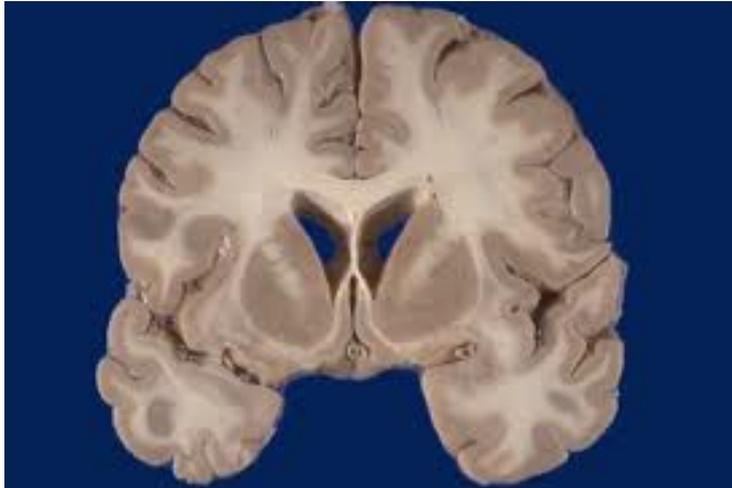


## Decision making



The decider

What should I be doing? Where should I be doing it? When should I be doing it? Apart from when we're asleep, these are the questions for which we must have answers, all the time.

"I don't see the problem? – I choose all of these things all the time".

"Oh, you do, do you? It's interesting that you think so because contemporary neuroscience suggests otherwise".

Recordings of brain activity indicate that decision-making regions of the brain are busy long before you realise you have made a choice – when I say 'long before' of course what I mean is fractions of a second. The interesting question then becomes – what does the brain being 'busy' mean? What are the problems that the brain is solving in the brief period of time *before* you realise you've chosen something? The answer is that it's engaged in the process of selecting.

The early and insightful psychologist William James pointed out (1890) that "Selection is the keel on which our mental ship is built". The idea behind this statement is the realization that our brain – the controller – is made up of many parts, a mental society if you will, with each member doing a particular job. Thus, different society members separately look after our energy balance (feeding), our fluid balance (drinking), our temperature regulation (turn on the central heating, or air conditioner). Another specializes in defense and yet another looks after reproduction and nurturing. The problem is, while they all work simultaneously, at any point in time, it's vitally important only one is allowed to direct behavior– you can't simultaneously approach and avoid or direct your attention to more than one thing. The brain's solution to these problems a specialized region called the basal ganglia. This evolutionally ancient group of nuclei resides in the brains of all vertebrates... because the problems of selection are common to all.

So, how does the basal ganglia choose what is the most important or urgent thing to do? The answer lies in the anatomical connections they have with other members of the brain's mental society. Each society member has an input connection to the basal ganglia that requests/bids for access to the movement generators. In turn the basal ganglia have inhibitory output connections that separately return to all members of the mental society. The normal function of basal ganglia outputs is to block access of each society member to the motor systems that generate behavior.

Selection is achieved by the basal ganglia 'listening' to all the incoming bids, noting which is the strongest/'loudest' and then removing the inhibitory block from the strongest bidder. That then enables the 'winning' member of the mental community to access the appropriate movement generators. The inhibitory block is maintained on all other bidders so only the one winning bidder can direct movements. Over the course of vertebrate evolution, the basal ganglia machine has been used to select between mental community members representing competing motivations, emotions, goals, ideas, movements, and stimuli. The difference between species lies in the different kinds of bids that are sent to the basal ganglia for selection – birds have bird-related bids, fish send bids appropriate for living in water, and mammals, including humans, have bids associated with their particular ecological niche on land, in the air and in water. Thus, while the content of incompatible bids of different species might differ, the basal ganglia mechanism that selects between them is common to all.

So if we all have a neural machine that operates by selecting the strongest bidder and blocking all weaker ones, why do we have an overwhelming feeling, most of the time, that we are in control – calling the shots? In psychological and neuroscience literatures this feeling is called a sense of 'agency'. Agency is not specific to the feelings we have about decision making, it also applies to sensations, ideas, emotions, and movements – "It is me that is looking, feeling happy/sad, having ideas, and moving". In such cases different regions of the brain become active/busy and the end product is a percept, a feeling, an idea or a movement. When the basal ganglia get busy, the end product is a decision, over which we have an acute sense of agency – I chose to do X. Yes, indeed. But in those circumstances could you have chosen to do Y?

The problem here is that we don't determine the relative strength of bids to the basal ganglia for actions X or Y. That is done by genetics – the aggressive rabbit and timid wolf haven't done well. Also, by our past experiences – in the past bids for X had good outcomes which made them stronger, while previous bad outcomes weakened the bids for Y – which is why X was chosen. Given that we determine neither our genetics nor the past that controls what we choose today, it's difficult to see where the idea of 'free-will' could fit into the process of decision making. Sure, we make choices and have the feeling 'it's us what done it', in the same way we feel it's us that's seeing when looking. However, what we actually choose is decided by which member of our mental society puts the strongest bid into to the basal ganglia.

Finally, what are the implications of these disturbing ideas? If someone couldn't possibly have made a choice, other than the one they did, how can they be held responsible? An answer would be that being held responsible is part of the experience that would influence future choices. If I'm told that stealing is bad, and that society will hold me responsible, the strength of any bid to steal in the future should be reduced. This suggests it would be foolish to abandon the idea of 'responsibility' in our criminal justice systems. An understanding of the neuroscience of decision making does, however, have another important implication. In situations where the neural machinery of decision making is damaged (psychopathy, schizophrenia) or badly distorted (drug addiction), holding someone criminally responsible couldn't work to influence future decisions – the mechanism by which it would, would be broken. If dangerous to themselves or others, such cases should either be put in secure accommodation, and/or treated as patients.