

Introduction

What is a coach?

‘An expert in facilitating self-directed neuroplasticity.’ Perhaps not the answer you normally hear, but certainly my favourite and one I use whenever I’m asked. Jeffrey Schwartz actually introduced me to this idea and I like to give credit to ideas I develop or share. Neuroplasticity is the brain’s ability to change. People are incredible and have a huge amount of potential. Coaches are skilled at working with individuals to help them bring out the best in themselves and rewire their brains to make it easy for those changes to become the norm.

Going back in time, a *coche* was the word for a wagon or carriage. Essentially it was and still is a vehicle that takes a person from A to B. A human *coach* now appears in many fields. Perhaps the best-known is still the sports coach whose responsibility it is to intensively train the people they work with. In the last 30 years, however, the role and definition of a coach have developed. It is common for managers in organizations to act as coaches. It is even hoped that parents at times act as coaches to their children.

Inevitably you will have your own definition of what a coach is and what they are expected to do within that role. There are now a huge number of different models, strategies and training programmes around coaching. We believe that an understanding of neuroscience will become expected to *underpin* everything that sits on top of what a coach does. Neuroscience is not claiming to be better than anything you currently do, nor is the suggestion that this should replace what you do. Rather we suggest it will enhance your understanding of those you work with.

What is neuroscience?

Neuroscience is the scientific study of the nervous system. This discipline and its research are extensive and cover a lot, including the development of the brain, its anatomy and how it works. It looks at what happens when

things go wrong, be it neurological, psychiatric or neurodevelopmental. It is a big field, and when positioning such a game-changing underpinning to coaching it is worth having a broad overview before focusing in on the parts most relevant to us. Today neuroscience has an interdisciplinary nature and liaises with disciplines such as mathematics, linguistics, engineering, computer science, chemistry, philosophy, physics, psychology and medicine. Several of these areas are of less interest to a coach.

Here are some of the areas you may hear or read about. *Affective neuroscience* is focused on how neurons behave in relation to emotions. *Behavioural neuroscience* is the study of the biological bases of behaviour, so it looks at how the brain affects behaviour. *Clinical neuroscience* is not usually of much interest to us as coaches because it focuses on disorders; however, a lot of interesting discoveries have come from this field. *Cognitive neuroscience* looks at the neural base for higher cognitive functions. *Cultural neuroscience* studies how our beliefs, values and practices are shaped by and shape the brain, minds and genes – a fascinating field that we hope will add lots to our understanding over the coming years. *Molecular neuroscience* looks at the individual molecules within the nervous system. *Neuroimaging* is the field that is expert in the various scanners that are used across the board. *Social neuroscience* brings the biological systems into the realm of social processes and behaviours. Both disciplines help refine and inform the other.

From the perspective of coaches, neuroscience is the field that can inform them on important things about the brain: things that are key to new ways that you work with clients and also that underpin things you are already familiar with. Neuroscience can explain why and how coaching works. It can enlighten coaches as to things to pay particular attention to. It can warn against other practices. As it is fundamentally concerned with the way that the brain works, its value to those working with other people's brains is quite vast.

At this point it is worth reiterating that neuroscience is not in any danger of taking over the skills, training and discipline that is coaching itself. It can certainly add to what is already there, but does not replace the great foundations that a coach has.

What can neuroscience offer the coaching world?

- An understanding of what happens when a person is being coached.
- Ways to create the best coaching environment for clients.

- For coaches who use particular models, an understanding of how they might work or an opportunity to stop using outdated concepts.
- A foundational understanding of the brain through which to evaluate everything.
- The opportunity to ask better-quality questions and consider what interventions would best serve your client.
- A focus on important considerations as to how to get desired action occurring: for example, mental stress leads to habit behaviour rather than goal-directed behaviour, so this informs how/when/what goal-directed behaviour should be attempted.

Our trained coaches tell us that it gives them a sense of credibility when they can explain the research that backs up what they are doing with their clients.

What is the vision?

The skills and knowledge that a good coach possesses can be so instrumental to a person living a good quality of life that it is my hope that in the future everyone is equipped. Imagine schools where teachers could effectively coach; organizations where managers, leaders and peers chose to coach; even, dare I suggest it, governments where coaching rather than attacking was the norm. With what we now know about the brain, and how people work, we have a huge opportunity.

People possess the precious ability to take in information, think and then act. This is grossly undervalued by individuals and by organizations. Coaching has the potential not only to help the person you are working with improve in these skills but to have a positive ripple effect.

Different ways of coaching

There are many models or ways of coaching out there. We've yet to come across one for whose practitioners we don't think neuroscience would be useful. Robert Dilts proposes that a coach has many roles at different times. He suggests that a coach may need to be in the role of guiding and caretaking, coaching, teaching, mentoring, sponsoring or awakening. Dilts elaborates on these roles in his excellent book *From Coach to Awakener* (2003). Here these roles are explored, sometimes adapted, and linked to various

neuroscientific principles or areas of interest. The role of this guide or caretaker can be considered to be providing support with respect to the environment where the changes are taking place, like a guide who holds a hand to take a child or blind person down a path from one place to another. It is expected, of course, that the guide knows where they are going and how to reach that desired destination. The caretaker is tasked with providing a safe and supportive environment. Dilts suggests that in this role it is important to attend to the external environment, provide what is needed and remove distractions.

This role, like all of those set out by Dilts, will be working on multiple neurological levels, utilizing different brain areas and chemicals, and would benefit from paying attention to various things that the scientific research is pointing us towards. None of these do we know for sure without doing brain scans and taking blood samples, and even then there are things we would not know in each individual situation. So, when we talk about what is going on for people in their brains and bodies when they are being coached it is normally an informed guess. We do know that in a trusting relationship, such as between coach and client, the release of oxytocin is triggered. This will be beneficial for both parties. At a basic level, by supporting someone you might be lowering their cortisol levels and enabling them to hear more clearly. If there is a high level of trust, which, as an effective coach, you hope would come at some point if not initially, then any threat response may be decreased and the person may be able to think more effectively. By attending to the external environment and removing distractions, you are creating a better environment for the prefrontal cortex to focus and be effective and efficient in high-level information processing and decision making.

Small 'c' coaching can be considered as focusing on the behavioural level of performance. It is suggested that this resembles sports coaching and involves promoting conscious awareness of resources and abilities. Careful observation and feedback are utilized to strengthen a person's abilities. It is often context-dependent so it might be used in areas such as 'style coaching', 'business coaching' and 'wealth coaching', where the coach is suggesting new behaviours.

This behavioural level of focus is very important as it leads directly to our results. The question becomes: what can influence our behaviour? Here we are directed in neuroscience to the underpinning of habits, how we are motivated, how we make decisions and to interesting new areas such as nudging and priming.

Teaching involves new learning. It can involve increasing competencies or knowledge or strategies for thinking and doing. At times during a coaching

relationship it may be important to be able to share something you think will help a person if you notice a gap in knowledge or competency. This is very obvious with neuroscience where there are things a person is doing that are not getting them the results they want, and where an acquisition of new information could really help. Learning new things and strengthening new competencies are important skills. Various brain areas are involved in these processes, for example the amygdala, hippocampus and basal ganglia.

Mentoring is described by Dilts as guiding a person to discover their unconscious competencies and overcoming internal resistance. He cites a belief in the person and validating their positive intentions as important components. The mentor has an impact on the beliefs and values of their mentee as their example unveils a little more of the person. Mentoring may involve mirror neurons or the action-observation network (covered in Chapter 21), especially when the mentor is a good example of something that the person being mentored wants to improve upon. It has been suggested that people learn tennis best by initially watching a good tennis player and then in essence copying them.

Sponsoring is described by Dilts as the process of recognizing and acknowledging the identity of the other person. This role of looking for and then helping to secure the innate potential that people possess is a critical role and one that is often forgotten in a corporate environment – with dire consequences. The idea is to connect with and validate someone deeply. This process enables the value within a person to manifest more fully. Sponsoring may be having effects at the level of the quantum brain. Things that would be more widely accepted now would be the potential of increasing an individual's serotonin and dopamine levels, activating the reward response and reducing any negative effects associated with loneliness.

The final role that Dilts proposes a coach holds is that of awakener. This is suggested to awaken others through the coach's own integrity and congruence. The idea here is to connect with missions and visions. The awakener role has an intensity about it, and is perhaps where real strengthening of new neural pathways occurs.

Why will a coach be expected to have an understanding of neuroscience?

It has been said that the gap between knowledge/theory and action is around 20 years. Since through the field of neuroscience we are now so much more equipped to understand what is going on in the brain it is only a matter of

time before some people know more than others. First adopters in various spin-off fields utilizing neuroscience are enjoying the benefits of this fascinating research. Neuroeconomics is a great example of a field that was working well without the ‘neuro’ component. When economics turned to neuroscience to see what it could learn, additional fascinating insights emerged. This is an exciting time for the field of neuroeconomics and one we expect will become a routinely available module for those studying pure economics in the near future.

With the fast rate that we are learning about the brain and mind we have already amassed a lot of data. There is a proportion of coaches who are equipping themselves with this information. It makes sense, right? If you are going to be working with people’s minds and brains then it is logical to know as much as you can about how these things actually work. You have started on this journey by reading this book. There are coaches who are also taking programmes in this area and equipping themselves with an in-depth understanding of neuroscience for coaches.

Organizations and individuals will continue to be discerning in how they choose their coaches. They will want the best, the most reliable and the most cutting edge. This means that coaches are expected to keep their knowledge up to date. When new information becomes available, especially knowledge that is so fundamental to the core of what one does as a coach, it is becoming expected that you are skilled in it.

How to approach the field

When coaches ask me this question I have several levels of response. The quickest answer is to approach the field ‘*curiously*’. If you only focus on one thing let it be your curiosity. This is a fascinating field that will develop a great deal more over the coming years, so now is the time to cover the basics and be curious about what you are exploring.

The next level of answer is to be *confident* in what you don’t yet know. Whenever I give talks on this topic, or on topics that are core to our main work of applying neuroscience to organizations, people comment that it is refreshing to work with someone who is comfortable saying that they do not know something. Rest assured that the field of neuroscience is a huge one. It would take you a long time to get to know everything in the field, and new things are discovered every week. Experts in their fields tend to be just that, expert in their field. That field is often very specific. An expert in decision making may have very little awareness of the research being done

on false memory. There is no shame in not knowing everything – however, there can be in pretending you do.

There has been suggestion that some people are turning to neuroscience in a superficial way, simply because it is a hot or sexy topic at the moment. That may be the case. People fall for gimmicks – they read a headline in a newspaper or even on what they consider a credible website and then use this surface-level piece of information to ‘prove’ something. Taking these shortcuts is very unwise in science. Evaluating the source, going back to the research and getting a full understanding is the best option to build reliable foundations and to be credible. In fields where you are working with people’s brains and minds, such as coaching, there will always be a place for understanding the science. It is illogical to suggest that neuroscience for coaches could be anything other than a positive step towards a better future.

What are the boundaries/limitations?

For coaches who are very new to the idea of neuroscience, having a contribution to make to their field in this area can be a challenge. Their expectation is that there will be specific new jazzy tools and techniques that are ‘neuroscientific’. They want to pull out of their bag their neuroscience tool and have their client go through a nicely packaged exercise. This desire is understandable: we like things to be simple, straightforward and easy to position with clients. However, good and experienced coaches know that there is a lot more to coaching than simply doing exercise after exercise with a client. This is where neuroscience comes in.

In this book we have at times included a section called ‘What I can do with a client this afternoon’. Sometimes there is a tightly correlated exercise that is nice and easy to complete and that would be great to explore with a client, if this is how you choose to coach. At other times there is not. It is actually even more exciting when there is more to it than a simple exercise! (This is a mindset shift for some coaches, while obvious to many others.) Building up an understanding of how your client’s brains and minds work is where the true magic lies.

Take, for example, the area of habits. We know a lot about how habits are formed in the brain and what areas are involved in these processes. There are many suggestions that can be used to support those you work with to gain increased control over their lives. However, there are also recent advances in our understanding of how habits work. We know that a small area of the prefrontal cortex is also involved in habits and specifically the

‘turning off’ of a habit. A natural question that people ask is: ‘Can we just turn off bad habits, then?’ Or, perhaps: ‘How do we turn off that area of the brain, then?’ Both of these questions are great and valid lines of thought – however, we don’t have a safe and practical answer just yet. Instead, work with habits currently involves creating new ones that become stronger and more favourable than the old ones.

The challenge this book faces

One of the challenges for a book like this is that we are discussing a field that is rapidly developing. New studies are being done every week and some of these inevitably give us information that is contrary to previous data. This book is not pretending to offer you a snazzy new comprehensive ‘solve all your coaching problems’ model. It is a starting point: an introduction to neuroscience for coaches.

The opportunity once the basics have been covered is to deepen your understanding of how you apply this information, by going on a well-designed programme. Here you can connect with a supportive group of coaches who can quickly accelerate your practical application of this material. You will, of course, have your own coaching style and skill sets. Suggestions are offered throughout this book only to stimulate thoughts. You need supervised practice and reflection in order to integrate what you learn into your chosen way of coaching.

There are some classic examples of what we want to avoid. Imagine a senior leader of an organization who read a book on leadership – 20 years ago – and nothing since. There may be some key concepts that still hold true, but it is fair to say that they would be a far better leader if they stayed connected to the field of leadership and updated their knowledge and skills. There is a fear with writing a book of this nature that coaches think ‘Well, that’s it then, I know all I need to know about neuroscience’. That simply will not be the case. We can look at this from a couple of perspectives. First, the field will be continually evolving and so it will be beneficial to keep connected. Second, this book is not *it*: while the hope is that it will serve as a good introduction, really getting the information inside you and being able to use it confidently and fluently with those you work with is the next step.

How you use this information is in the hands of each individual coach. There is a danger with being introduced to new and exciting information that we want to rush in and share it with everyone. As coaches we need to remember that we are here to facilitate self-directed neuroplasticity.

Our client's ability to think is a precious one – giving information inappropriately can destroy what Nancy Klein (2002) thoughtfully terms the 'Thinking Environment'. This precious environment deserves our respect.

What is the relationship between psychology and neuroscience?

In the past, and sometimes still in the present, there has been competition between the two disciplines. They have each, at times, looked down on the other. Psychology has accused neuroscience of being too reductionist; neuroscience has said that psychology can be inefficient and messy.

The benefit of psychology is that it can highlight phenomena that can prompt further exploration for mechanisms. Neuroscience can look at the more fundamental level and discover functional capacities of neural components. Links can be made here between behaviours and brain structures and function. Currently, while the two disciplines overlap, they are often working at different levels of things: neurons versus personality.

A useful analogy that can be drawn here is that of the Formula One car. Two main parties are involved in driving this car and, hopefully, winning races: one is the driver (the psychologist) – they are in peak physical condition; they know every detail of how their car performs (or are working towards this). If they want to go faster they know what buttons they need to press. When they have tricky bends coming up they know which way they need to turn the wheel and by how much. They have normally driven a track multiple times and can predict what the car will do at any given point. The other main party is the mechanics (the neuroscientists). These guys know what is under the hood of the car. They are focused on the nuts and bolts of the engine. They know that if they adjust some fluid by even just a small amount it will have an effect. They are interested in the most fundamental components of the car. Together the driver and the mechanics make a good team. Together they can each learn from one another and try different things.

Postscript: Second Edition

One of the most frequent questions I'm asked is, 'How do I use neuroscience?' It is a question that isn't asked by people who have studied neuroscience in depth. I have the privilege of speaking on a regular basis to people who describe themselves as sceptics. These are typically very experienced,

knowledgeable, skilled, successful coaches. Or academics. So far, without exception, the sceptics' objections are the same as mine. They dislike gross generalizations, inaccuracies and superficial use of anatomical or chemical jargon. They also agree with what we propose. In my experience even the sceptics don't disagree that understanding how our brains work can be useful to us in life.

The analogy the world renowned coach, author and coach trainer Myles Downey shared with me most recently was this. Imagine if I take my daughter out for a driving lesson and then ask her to pull over. I lift the bonnet of the car and ask her if she knows how a combustion engine works. Does that help her learn to drive? Interesting. I use a very similar analogy to propose the opposite. If I want to drive safely when there is ice on the road it can help me to understand the physics that predicts how the car will respond and so how I should handle that situation. If overall I want to drive faster it can help me understand gears, especially around bends. If the car stops working completely I need at the very least to know that it needs fuel, and which type of fuel in order to work. Anything more complex in my case normally means reaching out to an expert.

Coaches aren't experts in all human beings. I think it is fair to expect them to be pretty good at asking questions, though. All questions direct attention, and so are influential. Many things influence your ability as a coach to ask top-quality questions. The data you have uploaded into your brain, reflected on and utilized is only one thing. This book doesn't promise to be all things.

I was overwhelmed with positive feedback from the first edition of this book. People were using it as the foundational manual we had hoped. Many top-selling books were referencing insights from it. New books were being written that reorganized the material from it. People loved the logical, clearly laid out sections.

So why write a second edition? The exciting reason is that coaching has moved forward. Globally, top coaches are evolving, and it is important to keep the dialogue going around new features. We have seen neuroscience being put into action substantially over the past three years and it is useful to share the insights. Also, having run the Neuroscience for Coaches programme face to face and via a distance learning option in many countries now, it is great to be able to share those insights too.

Throughout this book we will share things top coaches have said to me in conversations. Here is a little background to the four coaches we will hear from.

Christian van Nieuwerburgh

Christian is a thoroughly nice guy. He is a well-respected executive coach, internationally recognized academic and sought-after consultant. He was an Associate Professor of Coaching at Henley Business School's Centre for Coaching and Behavioural Change and is now returning to the University of East London. Christian is particularly passionate about the power of coaching in educational settings. He is the editor of *Coaching in Education: Getting better results for students, educators and parents*, *Coaching in Professional Contexts* and *An Introduction to Coaching Skills: A practical guide*.

Kim Morgan

Kim is a much-loved coach. She created Barefoot, a coach training company offering externally certified University Master's Level Post-Graduate Awards in Coach Training in 2001. It also runs fabulous conferences. She offers fascinating insights as a trainer of new coaches, is an experienced coach herself and is adviser to organizations on creating coaching cultures. Kim is also the author of *The Coach's Casebook: Mastering the twelve traits that trap us*.

Marshall Goldsmith

Marshall Goldsmith has written many books including *Triggers: Creating behavior that lasts – Becoming the person you want to be* with Mark Reiter. The President of the World Bank, Jim Yong Kim, remarked: 'Marshall's coaching invites leaders to focus relentlessly on their behaviour. The leader's behaviour, as well as the team's behaviour, become the basis for great results and continuous improvement. This will be key to success for the connected, global, knowledge-driven companies of the future.' Marshall was named top executive coach by *Inc.* Magazine and the world's most influential leadership thinker by Thinkers50.

Susan Grandfield

After ten years in the corporate sector followed by another ten running her own training and coaching business, Susan began to recognize a need to help managers and leaders like herself deal with the challenges, the uncertainty, the pace and the demands of work and life. She attended the first

Neuroscience for Coaches programme and went on to develop her combined approach based on mindfulness and neuroscience to create a highly successful way of helping leaders, managers and their teams to ‘press Pause’ and regain a sense of balance in what they do. Susan introduces her approach through 1:1 coaching, group workshops, at speaking events and through her writing. Her most recent publication is *Pressing Pause: A practical guide to mindfulness in everyday life* (you can download it at www.sgdevelopmentsolutions.com).

PART ONE

Brain areas

‘What part of the brain does that?’ This common question is natural, but often unanswerable. With all the advancements in our ability to see into the brain while it is doing things, particularly through MRI (magnetic resonance imaging) scans and EEG (electroencephalography), people frequently have the expectation that we can explain everything by linking it back to a specific area of the brain ‘lighting up’. Fortunately, the brain is a little more complex than this. Despite possessing a fixed anatomy our brains exhibit diverse functionality. The question of how our brain does that is explored further in Part Four on dynamic functional connectivity. However, we first need to start with the foundations and then build up from there.

One of the most wonderful realizations felt by many of the participants of our Neuroscience for Coaches programme during the first module is that things are more layered than they previously realized. There is more going on in their client’s brains than they thought. Initially some coaches hope that they would be able to identify, with certainty, an area of the brain that is responsible for a certain problem their client is dealing with – and then fix it. They quickly realize, however, that this will not be the case.

So what is the point of learning about the different brain areas? There are several answers to this question. The first is that our knowledge shapes our filters and our questions. As coaches these are two of the most valuable things we have. Consider your filters and questions before you had any coach training... and afterwards. One hopes that they are quite different. It is the same once you learn about the different areas of the brain (and everything else you cover in this book and then during your further studies).

The second point of importance for learning about the different brain areas is to give you a solid foundation. The concepts we look at in this book have clear and direct applications to coaching, so when we start talking about mindfulness and the effect it has on the prefrontal cortex then it makes sense to know what the prefrontal cortex is, what it looks like when it isn’t working well, what it needs to work well – and lots more.

The third benefit is that at times you may want to discuss the areas of the brain with your clients, offering them an additional perspective to their situation. We cannot know for sure whether a particular brain area is involved with a problem or situation they are working on, but most of the time we don't need to. There are thousands of examples of how this would work in real coaching situations, in Chapter 2 on the basal ganglia we will look at just one. For a client who is working on changing their habits, being able to explain how and why the brain works with habits can be really useful to them.

It is important to bear in mind as we go through Part One that each time we get to the section 'What can I do with a client now having understood this?' what is being offered are only suggestions. What will work and be appropriate in one situation is not the same for another. You as the coach are best placed to blend the science with your art at this point and balance everything you know in order to make an informed decision about what would best serve the person you are working with.

Warning

We start with the basics for good reason. Students who work with us often find the first module, where we teach the anatomy and biochemistry, the hardest. They go on to tell us that the firm foundation was very rewarding as they progressed into the more practical insights from neuroscience. We've even had lecturers, trainers and L&D professionals say that they have restructured their programmes as a result of understanding more deeply how we learn.

There are now many other books and even programmes out there which cherry-pick the neuroscience they want to focus on. This approach is often what credible scientists and other professionals object to. Overall it has tainted people's feelings towards using insights from neuroscience. The surface-level approach means big chunks of important information are missed. By choosing quick and easy you often sacrifice correct and useful.

Before we dive into the different anatomical areas of the brain it is worth taking an overview perspective and touching on something you may have already heard of: the triune brain.

What is the triune brain?

The triune brain is a model that was developed by physician and neuroscientist Paul D MacLean in the 1960s (MacLean, 1990). It describes the evolution of the brain.

The hypothesis is that there are three parts to the brain: the reptilian, the paleomammalian (better known as the limbic) and the neomammalian. The first, the reptilian, comprised the basal ganglia and it was suggested that this complex was responsible for the instinctual behaviours. So drivers like aggression and dominance were said to come from this reptilian brain. It is the oldest in evolutionary terms.

The next in evolutionary terms is the paleomammalian complex. It contains the brain areas including the amygdalae, hypothalamus, hippocampal complex and cingulate cortex. The 'limbic system' was used to refer to this group of structures that are so interconnected. MacLean suggested that this limbic system was responsible for things like motivation and emotion involved in feeding, reproductive behaviour and parental behaviour.

The newest part of the brain, according to MacLean, is the neomammalian complex. This is basically the cerebral neocortex. It is responsible for our higher cognitive functions such as planning, perceiving and language. While the model is still in favour in some circles there are some challenges. Some of the arguments against this model are that:

- Some recent behavioural studies call into question MacLean's thoughts around the reptilian brain.
- Anatomically, the basal ganglia were also found in amphibians and fish (not just reptiles).
- Birds have been documented to have sophisticated cognitive abilities and language-like abilities.
- Not only paleomammals care for their children/offspring – even some fish do it.
- Crucially, it is now suggested that the neocortex was present in the earliest mammals.

Linked to this topic is the concept of the limbic system itself. There is a lot of controversy around this term. While some still use it freely, others say there is too much wrong with it. For example, the hippocampus is a key part of the limbic system. The idea is that the limbic system is the emotional centre of the brain while the neocortex is the cognitive zone. When damage is done to the hippocampus we see that people suffer from memory problems. Neuroscientists keep changing the boundaries of the limbic system. Joseph LeDoux suggests we should abandon it altogether.

Why is the triune brain model important to me as a coach?

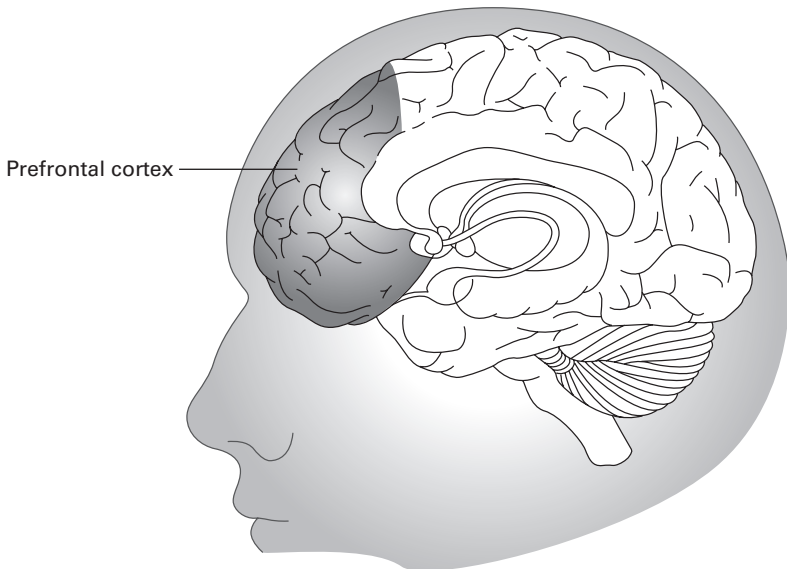
This model is fairly widely espoused in non-scientific circles. Having an understanding of it and what the science community are saying about it puts you in a more informed position.

Yet while this model is very attractive in its simplicity, it doesn't have the backing of neuroscientists across the board. So the suggestion here is to use with caution.

Prefrontal cortex

01

Affectionately thought of as the CEO or conductor of the brain responsible for a lot of higher-level cognitive functions, including attention and processing.



What is this brain area?

The prefrontal cortex (PFC) is an area of the brain found at the front of the head, behind your forehead in your frontal lobes. Evolutionarily it is one of the newest brain areas and is responsible for a lot of cognitive functions. The dorsal prefrontal cortex (dPFC) is interconnected with brain areas that are involved with attention, cognition and action. The dorsolateral prefrontal cortex (dlPFC) is known for being involved with short-term memory and is implicated in self-control. The ventral prefrontal cortex (vPFC) is interconnected with brain areas involved in emotion. The ventromedial prefrontal cortex (vmPFC) performs risk-benefit analyses after receiving inputs from the amygdala and other parts of the frontal lobes.

There is a famous story in the neuroscience world that involves a man called Phineas Gage. In 1848 Gage was a 25-year-old construction worker. He had been a respected friend to the men he worked with and was good at his job. One day there was an explosion while Gage was tamping powder with a fuse in a hole (before sand had been poured in). The rod weighed almost a stone, was 3 feet 7 inches in length and 1.25 inches in diameter. As it flew into the air it pierced Gage's left cheek, going through the base of the skull, traversing the front of his brain and exiting at high speed out of the top of his head. The rod mostly destroyed his frontal lobe, including his prefrontal cortex.

The first thing that amazed bystanders was that Gage was able to walk, talk and be 'normal' (remember that part of his brain was now lying some distance away on the end of a rod). The second thing is that he survived the predictable infections that in 1848 were treated without antibiotics. Yet although he was physically intact, his previous likeable personality was not. He became 'fitful, irreverent, indulging at times in the grossest profanity which was not previously his custom, manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinacious obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned... A child in his intellectual capacity and manifestations, he has the animal passions of a strong man.' The damage to his brain – as we can see (thanks to the skull being dug up, examined, and scanned) – was in the prefrontal cortices. His personality was changed forever and he was unable to make good choices.

Some more recent studies on people with prefrontal cortex injuries have developed our understanding of this region of the brain. When individuals

were asked what an appropriate social response would be under given circumstances they would give an appropriate answer. However, when they were actually making choices in real time they would select behaviours that were immediately gratifying even though they knew in the long term it wasn't the best plan. Our ability to delay gratification is very important to humans and is an example of a healthily functioning brain. Modern examples of short-term gratification at the expense of long-term benefits would be such as eating too much fatty foods, buying things today rather than saving for tomorrow, having extra-marital affairs and sitting down with a glass of wine in front of the TV rather than hitting the gym.

Why is it important to me as a coach?

The PFC is involved in:

- all our executive functions;
- our ability to plan;
- decision making;
- expressing our personality;
- aligning our thoughts and actions with internal goals;
- moderating social behaviour.

The psychological term 'executive functions' covers a wide range of activities. It includes the ability to determine good and bad, same and different, processing the future consequences of current activities, working towards defined goals, suppressing socially undesirable urges and predicting outcomes.

A professor of mathematical psychology, David Meyer, performed a wonderful experiment. He invited a group of young adults to test what happens when people are switching between things quickly. The experiment involved the participants working out mathematical problems and identifying shapes. When they had to switch between the tasks their accuracy and speed decreased as compared to when they could perform one task and then the other. In some cases multitasking added 50 per cent to the time required. Imagine a person working a 12-hour day and achieving the same results as a person working 8 hours, but with more mistakes and less elegance simply because the 12-hour day person was multitasking. 'Not only the speed of performance, the accuracy of performance, but what I call the fluency of performance, the gracefulness of their performance, was negatively influenced by the overload of multitasking' (Meyer *et al*, 2001).

Under stress our prefrontal cortex does not function well. The neural circuitry and neurochemistry of the PFC can be changed by our experiences. Stress during childhood and adolescence can be particularly impactful on the structure and function of the PFC, although these effects are not necessarily permanent. In adults it has been shown that even mild acute (as opposed to chronic) stress can have a rapid and dramatic impact on our PFC's ability to function. It can affect creativity, flexible problem solving, working memory and other processes. Many stressed-out people find it quite a wake-up call to discover that chronic stress literally can cause the architecture of their PFC to change. One study looked at the effects of psychosocial stress after one month. It showed that the subjects had impaired attention control and disrupted functional connectivity within a frontoparietal network that mediates attention shifts. The good news was that after one month of reduced stress their responses became normal again.

In a scenario where someone feels overwhelmed, with too much work to do or with a goal that is too big, then it can be useful to break it down into what needs to happen today. For example, if a budget meeting takes place and results in a huge financial goal that needs to be met, it could help to break it down into a weekly target. This could re-engage the dorsolateral PFC (short-term memory) by chunking things down into small short-term bite-sized pieces.

Conversely, when someone is feeling very anxious it may be that their ventromedial PFC is activated. Consider a personal coaching scenario where a person's spouse tells them that they no longer feel loved by them. The person may feel an immediate threat, imagining what would happen if they broke up and how difficult things would be in lots of ways. An aim here would be to reduce the immediate threat. Change the time frame from a very short-term one to a long-term perspective. It also may be useful to shift from an empathetic state to a cognitive one. Get planning – what could be done over the next month to help move the situation in the direction your client wants it to go?

What can I do with a client now having understood this?

In some coaching situations it might be appropriate to step into the teacher role and share some fundamental things about the PFC. This would be especially relevant to anyone working on their productivity, their efficiency or effectiveness.

What do you need to know about the prefrontal cortex?

- Its role is classically described as like that of a CEO (if you are business-minded) or a conductor (if you are musically minded) – in short, it is the boss, it is responsible for your ‘executive’ functions, which means your ability to think, choose, plan, etc.
- Over the years it has developed considerably, and recent studies indicate that meditation increases its size further still (see Chapter 28 on mindfulness).
- It is hugely energy-hungry, but gets drained quickly.
- Stress impairs its ability to use energy.
- Structurally, it is part of your frontal lobe, which is the area at the frontmost part of your brain.

So what is the motivation for ensuring our PFC is in good working condition? When our PFC is not working optimally we find ourselves:

- feeling lazy;
- feeling lethargic;
- uninspired;
- easily distracted;
- being poor at completing things;
- fixing attention on repetitive negative thoughts;
- being disorganized;
- being forgetful;
- feeling overly emotional.

On the other hand, when the PFC is working in tip-top condition you can look forward to:

- intentional awareness;
- a long attention span;
- being able to contemplate possibilities;
- being able to plan;
- being able to stick to the plan;
- focusing easily.

When the PFC is overworked it doesn't function well at all. To rectify this situation, check out the recommendations below. If the PFC is not

functioning properly this makes it very difficult to be effective, let alone efficient, which is often very frustrating when we are trying to get through the day. At such times it is quite common to feel that something is wrong and to perhaps fall back on old habits. This is a form of survival mechanism. When people find themselves micromanaging, controlling or punishing there is often a brain deficit involved. This doesn't always mean that something is overactive; an underactive PFC causes problems too. Dopamine, you'll soon find out, is the neurotransmitter that has many functions for the brain including reward, motivation, working memory and attention. When the brain has a lowered ability to use or to access dopamine it means that other brain areas aren't being quietened down in order to enable the brain to focus on one thing at a time. This makes life difficult for us because we struggle to focus, so become less efficient.

As a coach you could also step into a mentoring role and lead by example, by following these recommendations:

- Turn off the e-mail function on your mobile phone in the evening so that your brain has downtime before you start work the next morning.
- Prioritize the big weekly tasks first then smaller tasks on a daily basis (experiment with the night before or first thing in the morning to see what works best for you).
- Turn on e-mails only at certain times of the day.
- Monotask for short- and long-term benefits.
- Pick small things you know you can achieve and then do them – this could raise your dopamine levels.

Equally, you could work with your client to help them experience their pre-frontal cortex working well. Take them out of their normal working and thinking environment – for example, if they are normally office bound, take them into the countryside. Help them to connect with their senses, feeling the wind in their hair, the sun (hopefully) on their skin and breathing in all the different smells. The hope would be that this change of environment would invite some fresh thinking.

Reality check from Amy

This chapter on the PFC is pivotal. I am saturated in the insights from neuroscience. I live and breathe them. I always expect the general population to know more than they do. Coverage of brain-related stuff is now widespread.

I am constantly shocked, however, by how little people actually know in depth. There are a handful of people who have now read ten books on these topics and perhaps even a couple of scientific papers. But wherever I am in the world, walking into a room to talk to people, the vast majority don't really have a basic knowledge of neuroscience, let alone have they considered how this might affect their work. This means that your coaching, especially when deeply underpinned by an understanding of the brain, could help a lot of people.