

## Challenging Homeostasis, 'Peak' (extract) – Ericsson and Pool (2016)

Why should the human body and brain be so adaptable in the first place? It all stems, ironically enough, from the fact that the individual cells and tissues try to keep everything the same as much as possible.

The human body has a preference for stability. It maintains a steady internal temperature. It keeps a stable blood pressure and heart rate. It keeps the blood glucose levels and pH balance (acidity / alkalinity level) steady. It maintains a reasonably constant weight from day to day. None of these things are completely static, of course – pulse rate increases with exercise, for instance, and body weight goes up or down with overeating or dieting – but these changes are usually temporary, and the body eventually gets back to where it was. The technical term for this is “**homeostasis**,” which simply refers to *the tendency of a system – any sort of system, but most often a living creature or some part of a living creature – to act in a way that maintains its own stability.*

**Homeostasis** - *“the tendency of a system – any sort of system, but most often a living creature or some part of a living creature – to act in a way that maintains its own stability.”*

... cells require a stable environment if they are to function effectively. If the surrounding tissues get too hot or too cold, if their fluid level drops too far, or if the energy supplies get too low, it damages the functioning of the cells. **If the changes are too big for too long, the cells start to die.**

Thus, the body is equipped with various **feedback mechanisms that act to maintain the status quo**... Consider what happens when you engage in some sort of vigorous physical activity... the body takes various measures in response... As long as the physical exercise is not so strenuous that it strains the body's homeostatic mechanisms, the exercise will do very little to prompt physical changes in the body. From the body's perspective, there is no reason to change; everything is working as it should.

It's a different matter when you engage in sustained, vigorous physical activity that pushes the body beyond the point where the homeostatic mechanisms can compensate. Your body's systems and cells find themselves in abnormal states, with abnormally low levels of oxygen and various energy-related compounds... The metabolism of the various cells can no longer proceed as usual... and they respond by calling up some different genes from the cells' DNA... **changing the cell's behaviour in response to the surrounding systems being pushed out of its comfort zone.**

*“Living cells change their **behaviour** in response to the surrounding system being put under **stress** and pushed out of its **comfort zone**. Bodies work to compensate for the new demands and establish a new comfort zone, re-establishing homeostasis.”*

This is the general pattern for how physical activity creates changes in the body: when a body system – certain muscles, the cardiovascular system, or something else – is stressed to the point that homeostasis can no longer be maintained, the body responds with changes that are intended to reestablish homeostasis.

This is how the body's desire for homeostasis can be harnessed to drive changes: push it hard enough and for long enough, and it will respond by changing in ways that make that push easier to do. You will have gotten a little stronger, built a little more endurance, developed a little more coordination.

But there is a catch: once the compensatory changes have occurred – new muscle fibers have grown and become more efficient, new capillaries have grown, and so on – the body can handle the physical activity that had previously stressed it. It is comfortable again. The changes stop. So, **to keep the changes happening you have to keep upping the ante**: run farther, run faster, run uphill. If you don't keep pushing and pushing and pushing some more, the body will settle into **homeostasis**, albeit at a different level than before, and you will stop improving.

This explains the importance of staying just outside your **comfort zone**: you need to continually push to keep the body's compensatory changes coming, but if you push too far outside your comfort zone, you risk injuring yourself and setting yourself back.

One major **difference between the body and the brain's responses to challenge** is that the cells in adult brains do not generally divide and form new brain cells (with some exceptions) – instead, the brain **rewires neural networks** by strengthening or weakening the various connections between neurons, and also by adding new connections or getting rid of old ones. There can also be an increase in the amount of **myelin**, the insulating sheath that forms around nerve cells and allows nerve signals to travel more quickly; myelination can increase the speed of nerve impulses by as much as ten times. **Because these networks of neurons are responsible for thought, memories, controlling movement, interpreting sensory signals, and all the other functions of the brain, rewiring and speeding up these networks can make it possible to do various things that one couldn't do before.**

In the brain, the greater the challenge, the greater the changes – up to a point. Recent studies have shown that learning a new skill is much more effective at triggering structural changes in the brain than simply continuing to practice a skill that one has already learned. On the other hand, pushing too hard for too long can lead to burnout and ineffective learning. **The brain, like the body, changes most quickly in that sweet spot where it is pushed outside – but not too far outside – its comfort zone.** ... Regular training leads to changes in the parts of the brain that are challenged by the training. **The brain adapts** to the challenges by rewiring itself in ways that increase its ability to carry out the functions required by the challenges.

Once we understand the **adaptability** of the brain and the body in this way, we start to think about human **potential** in an entirely different light, and it points to an entirely different approach to **learning**. For example, the reason that most people don't possess extraordinary physical capabilities isn't because they don't have the capacity for them, but rather because they're satisfied to live in the comfortable rut of homeostasis and never do the work that is required to get out of it. They live in the world of "good enough". But it's important to remember that the option exists. **If you wish to become significantly better at something, you can.**

**And here is the key difference between the traditional approach to learning and the deliberate practice approach: The traditional approach is not designed to challenge homeostasis.** It assumes, consciously or not, that learning is all about fulfilling your innate potential and that you can develop a particular skill or ability without getting too far out of your comfort zone. In this view, all that you are doing with practice – indeed, all that you can do – is to reach a fixed potential.

*With **deliberate practice**, however, the goal is not just to reach your potential but to build it. This requires **challenging homeostasis** – getting out of your **comfort zone** – and forcing your brain or your body to adapt. But once you do this, learning is no longer just a way of fulfilling some genetic destiny; it becomes a way of taking control of your destiny shaping your potential in ways that you choose.*