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link to Reader's Digest article [1]

brain [2] wonder [3]



Your nervous system allows you to think, move and feel. But there's a whole other part of the nervous system that is largely outside of your control, operating automatically and quite independently from your conscious mind—and it keeps you alive.

Busy doing nothing?

So goes the song by Richard Sherman—and, borrowing these words to speak about the human body, it's true that when your conscious self thinks that it's "doing" nothing, your body is actually *incredibly busy*, carrying out all those things that are done automatically, like breathing, pumping blood and digesting food.

"Doing nothing is the something I do best" ends the song—and though it's hard to compare the different divisions of the nervous system, the things that your body does automatically are really rather brilliant. So much so that the US physiologist Walter Cannon wrote "Providence in its wisdom decided that they should be outside the range of voluntary control." It's actually very good news that we don't have to remember to tell our hearts to beat or our lungs to breathe. When would we ever sleep?

The part of your nervous system that works automatically is called the "*autonomic nervous system*", and it supplies every organ in your body. Here are some of the ways in which it is important.

1. Survival

During a strenuous workout, your heart beats about 120-150 times each minute; during sleep, the number is more like 50-60. Your autonomic nerves control your heart rate, the force with which your heart beats and ultimately your blood pressure. When these nerves become damaged, your blood pressure [4] can rise or fall very dangerously.

By acting on your *blood vessels*, the autonomic nerves help determine blood flow and the distribution of blood in the body, diverting, for example, blood from the gut to the muscles during exercise. Blood supply to the brain is so essential that it is automatically kept constant (at about 750ml every minute).

The strong waves of gravity-defying muscular contractions that squeeze food through your digestive tract are enhanced by the autonomic nervous system (helping in the formation of faeces); the width of your airways is similarly sensitive.

2. Secretions

Did you know that you produce about a litre of saliva every day, three litres of stomach juices and, on average, 1.2ml of tears [5] (even when you're not crying)? You also automatically produce secretions in your lungs, your gut, your pancreas and your gallbladder.

Sweating is useful in regulating our temperature and is likewise driven by the autonomic nervous system, making it something that we cannot control. Lie detectors [6] take advantage of the sweat response, seeking an increase in sweat when the subject is lying. Other automatic functions such as heart rate and breathing rate are also monitored to indicate whether or not the suspect is telling the truth. Being nervous can trigger similar responses.

3. Seeing

"Belladonna [7]" or deadly nightshade is one of the most toxic plants known and was used in eyedrops during the Renaissance to make women appear seductive—by dilating the pupils of their eyes (*bella donna* means "beautiful woman" in Italian).

The normal human pupil can change in diameter from 1.5mm to 8mm (an impressive 28-fold change in area), letting just enough light in, but not too much—and also helping bring blurred objects into focus.

The size of your pupil changes automatically according to the light when two separate muscles in each eye contract and relax at equal and opposite times to each other to change the opening in the iris (the coloured part of the eye). It's good that we don't have power over our pupils, since forgetting to limit light entry by decreasing their diameter would lead to lasting eye damage.

Blood supply to the eye and pressure within the eyeball are also, thankfully, under automatic control.

4. Standing

Whilst this is of course a conscious activity, the unconscious part of your nervous system plays an important part in helping it to happen.

When we stand up [8], gravity causes blood to pool in our legs, dropping our blood pressure, perhaps causing us to faint. Just as a barometer measures air pressure, we have "baroreceptors" automatically detecting the drop in blood pressure near our heart. They act very quickly to counter the drop by speeding up the heart and making it beat stronger.

Preserving blood flow to the brain, when much has pooled in the buttocks and thighs, is essential. Less important organs like the gut automatically sacrifice some of their plentiful supply by narrowing their blood vessels, donating

blood upwards—much like an internal blood transfusion. If only humans gave so willingly during times of need.

5. Sex

What do spending a penny and having sex have in common? Both rely on the conscious and unconscious nervous systems working together in a coordinated fashion. You are, after all, happily unaware of your bladder as it automatically fills with urine, becoming conscious of it only when you come to empty it. During sex, you will be very aware of your intimate parts, and able to control them to an extent—but the precise timing of erection (of the penis or clitoris) and ejaculation (of sperm) is under automatic control—and doesn't always happen when you want it to.

The womb is richly supplied by autonomic nerves which automatically control its blood supply. Amazingly, they seem to disappear in patches during late pregnancy [9] and reappear later. It's thought that this preserves a bounteous blood supply to the placenta.

Sense of perspective

Much of your body is outside your control. You are like a self-driving car, able to function safely with very little human input: people can survive in a coma for decades. You are not master of your body (but need to take care of it), and that's good news because you can spend time thinking, learning, listening and loving instead. Look inwards and be grateful and then spend time looking outwards.



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