

Many personality traits can be observed but there are other hidden forces that shape who we are.



By Christian Jarrett
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We usually think of personality in terms of the differences we can see – Sarah is smiley and chatty, John frets a lot, while Noah is neat and tidy. These differences are fascinating, but if we focus only on observable behaviour, it doesn't tell us much about the roots of personality.

Looking inside our body gives greater clues. And a trickle of recent findings has recently turned into a torrent, as studies are now revealing how personality is linked with many aspects of our biology, from our hormones and our immune system to the microbes in our gut.

These are important discoveries because personality – especially the traits of conscientiousness and neuroticism – is strongly associated with our future mental and physical health and longevity. Uncovering the physiological basis of personality might help explain why.

- **How does sex define your personality?**
- **When did your personality first emerge?**
- **When personality goes from bad to good**

Some of the founding fathers of the psychology of personality wondered about this very question. Writing in 1961, the US psychologist Gordon Allport said he had faith that “sometime in the distant future, well-proved facts concerning personality will be found to interlock with well-proved facts of human biology,” but he acknowledged that biology had a lot of catching up to do.



We usually think of personality in terms of the differences we can see (Credit: Getty Images)

Later the same decade, the German-born English psychologist Hans Eysenck went further, publishing the *Biological Basis of Personality*— a tentative map, as he saw it, for grounding psychology in physiology. In 1987, he **reflected** that his own research with twins had shown that personality has a genetic basis and that, “if this was so, then surely it should be reflected in certain physiological structures, biochemical secretions, and other biological features of the organisms...”.

Eysenck and others believed that our personality largely comes from arousal levels in the brain and their ideas centred on differences between introverts and extroverts. They would have been amazed and delighted at our recent understanding of how personality gets under our skin.

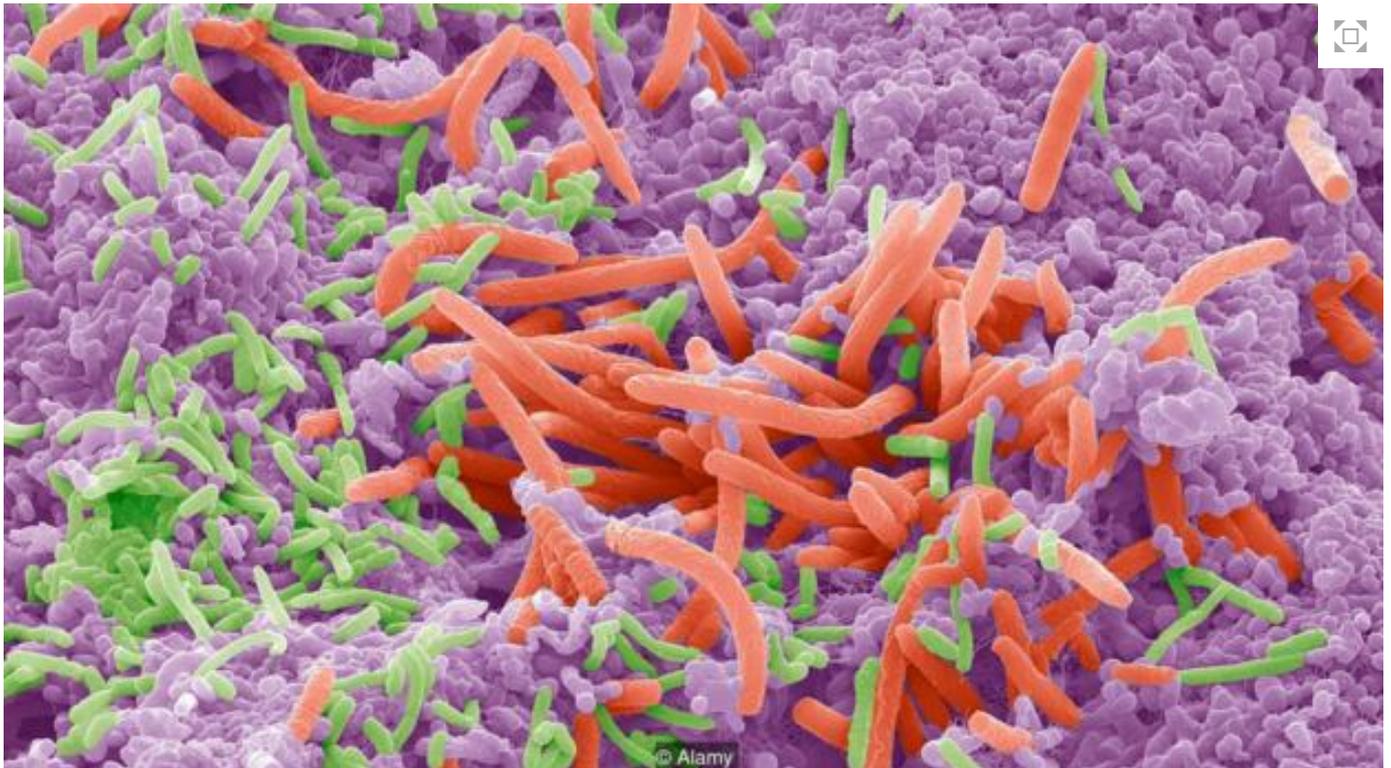
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Highly conscientious people are also less likely to be stressed

Take the hormone cortisol, which is released when we get stressed. Early research linking cortisol and personality produced inconsistent results. But these studies relied on taking occasional saliva swabs, which isn't ideal because cortisol levels fluctuate so much throughout the course of a single day, let alone over weeks and months. However, **a study** published late in 2017 overcame

this problem by analysing cortisol levels in the hair of over 2,000 participants, who also completed personality questionnaires. The researchers cut off 3cm of hair from each volunteer, which provided a measure of cortisol that had accumulated over the last three months.

The higher that participants scored on the trait of conscientiousness (which is associated with self-discipline, orderliness and ambition), the lower the levels of cortisol in their hair. Importantly, the researchers also recorded how healthy participants were, looking at their diet, exercise and alcohol intake. Conscientiousness correlated with healthier scores on all these measures, which makes sense, but importantly the link between hair cortisol and conscientiousness remained, even after factoring out differences in these health-related behaviours.



Personality is linked with many aspects of our biology, from our hormones and our immune system to the microbes in our gut (Credit: Alamy)

This study therefore provides early evidence that highly conscientious people are also less likely to be stressed. That is, they don't just have lower cortisol levels because they lead a healthier life, but also because at a basic physiological level they are less sensitive to stress, which might contribute to their living longer, healthier lives than others, on average.

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We often hear about good or friendly gut microbes and bad microbes for our physical and mental health

There's another personality trait that's strongly related to health: neuroticism. People who score highly on this trait are prone to anger, hostility, low moods and worry. They are also more at risk of

poor physical health. New findings show how this might be reflected at a surprisingly deep level within their bodies, in the microbacteria that live in their gut. In another **study** published in 2017, researchers analysed DNA from 672 faecal samples, provided by volunteers who had also completed personality questionnaires. Even after controlling for differences in diet, the researchers found a small but significant association between higher scores on neuroticism and levels of Gammaproteobacteria, which include many pathogens.

We often hear about “good” or “friendly” gut microbes and “bad” microbes for our physical and mental health. Gammaproteobacteria include potentially harmful bacteria that tend to fit in the latter category. Raised levels can also be a sign of chronic inflammation (acute inflammation helps the body cope with injury and infection, but chronic inflammation is harmful). Good microbes, in contrast, can contribute to health and are **important for brain development**. In this research, conscientiousness was also related to the microbiome – less conscientious participants tended to have lower levels of the “friendly” bacteria Lachnospiraceae, which can help prevent chronic inflammation and ensure the maintenance of a healthy weight.



The hormone cortisol, which is released when we get stressed, can be measured in our hair (Credit: Getty Images)

That personality and the microbiome are linked could therefore help explain why people with a more neurotic, less conscientious personality are more vulnerable to illness than others.

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Open-minded individuals tend to lead more active, intellectually varied lifestyles

The picture remains complicated, however, and these new studies are only preliminary. We cannot yet clearly identify what comes first – does personality affect the microbacteria in the gut, or vice versa? However, we do know that the two are linked very early in life: a 2015 **study** found that various characteristics of the gut microbacteria correlate with temperament in toddlers aged just 18-27 months. For example, among boys and girls, those who were rated as happier and more active by their mothers, which is a sign of toddler extraversion, also tended to have more diverse gut bacteria, which is good for health, and this wasn't entirely due to differences in their diet.

Other markers of chronic inflammation in the body also relate to personality. A **2014 study** of over 26,000 people found that individuals who scored high for conscientiousness also produced lower levels of certain proteins released by the immune system to fight disease, including C-reactive protein and interleukin-6, as measured by blood sample. Higher openness (associated with a willingness to try new things and aesthetic sensitivity) was also correlated with lower C-reactive protein. The researchers believe the latter association might be because open-minded individuals tend to lead more active, intellectually varied lifestyles, which in turn, helps reduce their systematic inflammation.



Good microbes are important for brain development (Credit: Getty Images)

Of course, few of us spend much time worrying about our microbiome or C-reactive protein levels. However, aspects of our bodies that we are much more familiar with, including our blood pressure and heart rate, are also associated with personality. For instance, **a study published in 2017** of over 5,000 British 50-year-olds, found that those with hypertension were more likely to score highly on neurotic traits and low on conscientiousness, highlighting another route by which these traits may influence physical health.

Meanwhile, although a low-resting heartbeat is usually considered a sign of good physical health, when it comes to personality, the implications are darker. **Several studies** have found that a lower resting heart rate correlates with higher psychopathy scores. People who match this description show superficial charm, fearlessness and impulsivity. This is not too surprising considering studies already **link low-resting heart rate with aggressive and criminal behaviour**. The two main explanations are that low heart rate is a sign of fearlessness and that it can reflect an unpleasant state of being “under aroused”, prompting some psychopathic people to seek relief through violence and conflict. As ever, more research is needed to test these ideas.

Clearly our personality is deeply associated with the physical make-up of the body. In the not-too-distant future, it may be possible to measure personality in a completely different way. Rather than using questionnaires and observing behaviour, we might be able to use a blood test and heart-rate monitor, to assess the proteins, hormones, microbacteria and pulse beneath a person’s skin.

We may therefore soon see the biology of personality catching up with the psychology, as Gordon Allport hoped it would all those decades ago.

*Dr Christian Jarrett edits the British Psychological Society's **Research Digest** blog. His next book, **Personology**, will be published in 2019.*

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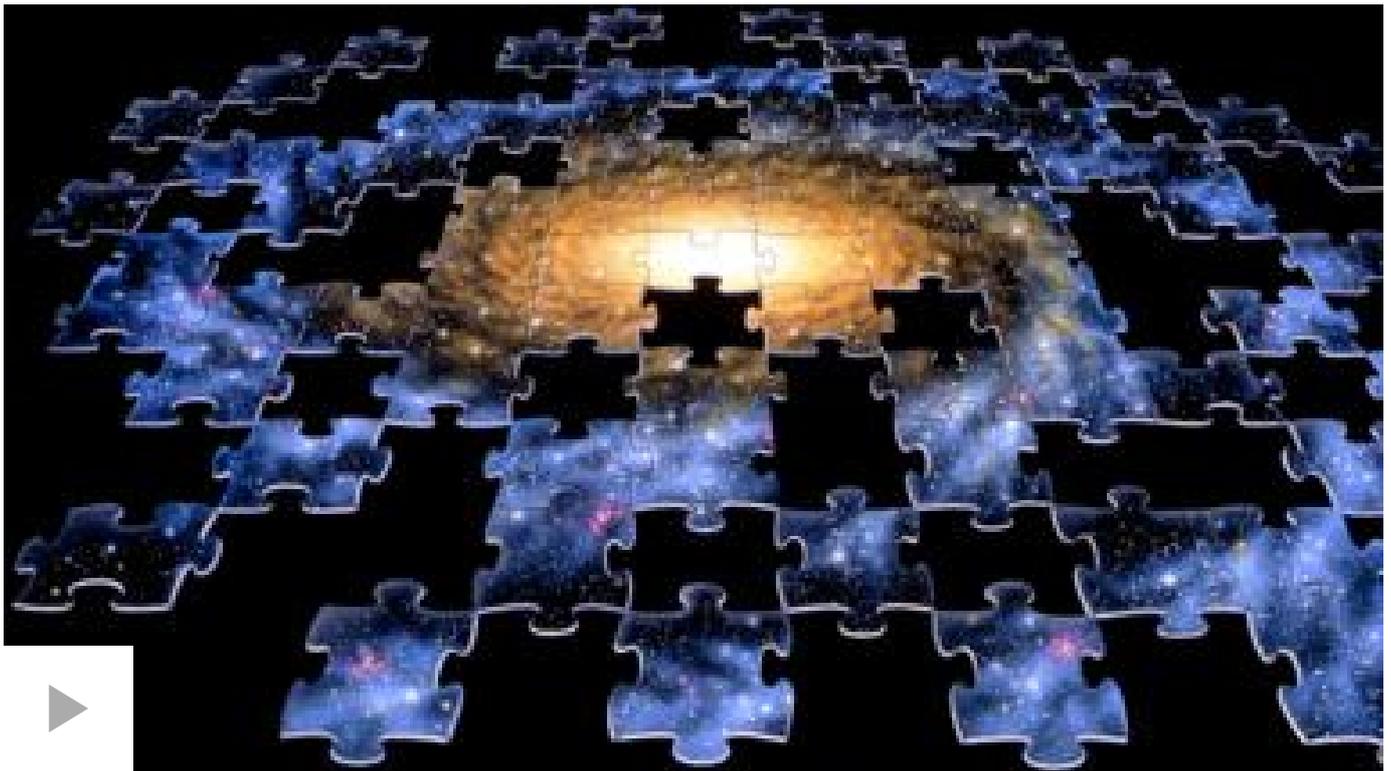


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