

WHETHER on page, stage or screen, the story of human health and happiness is often presented as an inevitable arc between birth and death. William Shakespeare captured this best with his “seven ages of man” speech. We enter the world “mewling and puking” as an infant, pass through the awkwardness of childhood and adolescence into our physical and mental prime, before a slow decline.

Until recently, science appeared to confirm this view. For many abilities, we seemed to reach our peak well before midlife. But it is now becoming clear that this picture is far too simplistic. Childhood and adolescence may offer the most rapid periods of development, but our brains can change in positive ways throughout life, with some important cognitive skills continuing to improve into

our 50s, 60s and 70s. “The whole idea that the brain is fully mature at age 25 is a joke,” says Daniel Romer, a psychologist at the University of Pennsylvania.

Nor does our fitness simply rise, peak and fall in a curve. While 20-somethings may win a sprint, performance in many other sports can reach a high later in life. That’s not to mention factors like emotional well-being and mental discipline, which rise and fall in unexpected patterns. And despite nostalgia for the joys of youth, for most of us, our happiest days are actually yet to come.

By learning to recognise these patterns, we can find better ways to nurture our growth and embrace the opportunities available at each stage of life. So what, based on science, are the seven ages of you? And how can you make the most of them?

CHILDHOOD Original thinking

It is a great shame we can’t remember our first few years. In terms of the sheer number of changes to the body and brain, early childhood sees the greatest transformations of our lives. We not only learn essential skills for survival – how to walk and feed ourselves – but also language and how to recognise what others are thinking and feeling.

Neurologically speaking, a lot of this transformation involves the steady strengthening of connections between certain brain cells and the pruning of unnecessary connections between others. For some areas, such as the visual or auditory system, this happens rapidly during the first few years. This could explain why childhood is a peak period for learning, especially for sensory skills such as developing the accent of a language or perfect pitch in music. For other brain areas, such as the prefrontal cortex involved in higher level thinking and decision-making, this neural pruning and strengthening continues beyond our teens.

Much of this childhood brain development may arise from a form of statistical learning that resembles the scientific method: making predictions about the world and updating them according to evidence gained through experience. To gather this information, a baby’s attention will drift to anything that is unexpected or surprising – explaining why they are so intensely curious about even the most trivial details. Over time, the process helps them to recognise objects and sounds and to work out what different words mean.

Imaginative play can aid this process, particularly as the child begins to explore the sophisticated thinking that defines our species. Humans engage in counterfactual reasoning, for example, which involves considering complex hypothetical scenarios and exploring the consequences. Playing pretend seems to train that capacity. As developmental psychologist Alison Gopnik points out in her book *The Philosophical Baby*, children spend a huge amount of time in imaginary worlds honing those skills, compared with adults. ▶

The seven ages of you

No single stage is the prime of life, as each decade brings new strengths. The trick is to identify them, says **David Robson**



MATT MURPHY

This might explain why childhood is a key period for creativity and imagination, with youngsters scoring highly compared with older people on tests of original thinking – thinking up unexpected uses for an object such as a brick, for instance (adolescents generally score more highly too).

As a child grasps more words, a growing ability to tell stories will also affect their ability to remember their life; our autobiographical memory seems to grow with our language skills, which may explain why our recollections of the first few years are hazy at best.

ADOLESCENCE

Risks and rewards

We may think that the wayward teen is a modern invention, but the stereotype can be traced at least to the ancient Greeks. The youth, according to Aristotle, are prone to “overdo everything”. Shakespeare took a similarly dim view: “I would there were no age between ten and three-and-twenty... for there is nothing in the between but getting wenches with child, wronging the ancientry, stealing, fighting”.

Puberty – with all those sex hormones rushing through the veins – might seem to be the most obvious reason for this unruly, impulsive behaviour. Until recently, teens were also thought to undergo some characteristic brain changes that impair their capacity to act rationally. The brain’s limbic system, which governs motivation and reward, matures much more quickly than the prefrontal cortex, which is essential for behavioural inhibition and logical thought. As a result, teenagers were thought to have “imbalanced” brains wired to experience uncontrollable emotions, with little capacity to rein them in until their mid-20s, which is when the prefrontal cortex finally catches up with the limbic system. Until that point, adolescents were thought to be incapable of making good decisions – an idea that is still popular today.

In Romer’s opinion, it is time to ditch these stereotypes. “They are a very gross generalisation,” he says. There is actually limited evidence that most teens have a severe deficit of self-control, he says.

It is true that the capacity for “sensation seeking” behaviour – the desire for varied, new and intense experiences – peaks between the ages of 16 and 19, which may explain the willingness of teenagers to take risks. But Romer thinks that scientists should focus more on the many benefits of teen spontaneity and curiosity when trying to explain their risk-taking behaviours. “Adolescents are exploring and trying things out,” he says. “That’s going to involve a certain amount of risk. But you have to try things out in order to learn if they’re successful and adaptive.”

Whether it is their attempts to explore their sexuality or a desire to travel, the drive to seek new sensations helps adolescents to amass a wealth of experience that they can draw on in later life. This is aided by the underappreciated trait called tolerance of ambiguity. Adolescents are particularly good at coping with uncertain outcomes, which is why they are able to embrace new situations so readily.

We also need to appreciate the need adolescents have to establish themselves socially. A stable social network is essential for our well-being as adults. According to some researchers, this could explain why teens are so keen to avoid rejection and are

prone to peer pressure, even if it involves acting recklessly. They may simply calculate that the risks are worth it given the possibility of cementing relationships, which isn’t necessarily an irrational decision if your goal is to set up a secure friendship circle.

TWENTIES

Faster and happier?

For many people, the third decade is the most exhilarating period of their lives, when they launch into the wider world, often establishing a career and meeting their life partner. Little wonder that, looking back from old age, most people have much richer recollections of their early 20s, compared with any other decade – a phenomenon known as the reminiscence bump.

Interestingly, the memories within the reminiscence bump are almost universally positive. Perhaps because it makes a more satisfying narrative of this defining decade, we preferentially recall happier events, while the stresses tend to be forgotten. In reality, you are less happy in your 20s than in adolescence or old age. Nostalgia is often harmless, but it can be helpful to take off those rose-tinted spectacles and question some assumptions about these heady years. It is common, after all, to assume your 20s were your physical and mental prime, suggesting that the rest of your life is an inevitable decline. But the truth is more complicated.

Consider your fitness. It is true that elite swimmers usually reach peak performance at 20, and sprinters tend to do the same at 24 to 26 – after which there is often a steady decline in performance in these sports. This is the result of biological changes, such as the loss of some “fast twitch” muscle fibres, which create the sudden bursts of energy necessary for high speed and explosive strength.

For professional sprinters, this soon creates an insurmountable barrier. “At that level, even a 0.5 per cent decline in overall performance can hold you back,” says Gennaro Boccia at the University of Turin in Italy, who has recently studied age-related changes in the performance of Italy’s top athletes. But such



A teenager’s desire to try new things pays off in later life

DEEPOLY/PLAINPICTURE/JUWEUMSTÄTTER



Many people think of their 20s as the best time of their life

impacts are generally irrelevant for the rest of us in our everyday attempts to remain fit and active. “In the general population, you only start seeing a decline in your performance after 40,” Boccia estimates.

The brain’s trajectory after 20 is similarly complex and doesn’t represent a simple decline. In a series of experiments, Laura Germine at Harvard Medical School has tested tens of thousands of people to examine the differences in cognitive abilities between age groups. Her findings confirm that 20-somethings do seem to have the edge in measures of reaction time and capacity to solve novel problems quickly. Yet many important skills – including working memory

“Many important cognitive skills reach their zenith in later life”

capacity, face recognition, emotion perception and the ability to sustain concentration – reach their zenith much later in life.

THIRTIES Staying power

If your 20s were defined by speed – both physical and psychological – then your 30s might be considered the decade of endurance.

This is evident in the peak performance of long-distance athletes. For male marathon runners, the ideal age appears to be 31 years old. For women, it is slightly less, 27 years, although champions like Paula Radcliffe have continued to win until their mid-30s. The peak age for a 100-mile ultramarathon, meanwhile, is 37 for men and 38 for women.

Why would this be? The loss of fast-twitch muscle fibres will have little impact for sports that rely on stamina. But people in their 30s do face a drop in aerobic capacity – the body’s efficiency at delivering oxygen to the muscles – which could reduce performance. The extra years of experience may, however, bring the advantage of improved emotional regulation and planning, and these can help athletes to pace themselves during endurance events and to cope with the inevitable stress and exhaustion. This could offset the early stages of the physiological decline, creating a sweet spot in an athlete’s 30s.

The brain is also hitting its stride on an important measure of cognitive ability. Germine has found that performance on certain working memory tasks – such as the capacity to hold multiple pieces of information in mind at once – peaks in our early 30s. It isn’t hard to see how this might be beneficial, as demands of home and work start to build over the decade.

Sure, by this age our mental processing speed is a bit slower, but this loss is a small trade-off for the many other abilities we acquire as we age. “You may not be as fast as you were when you were 20, but you don’t need that [speed] when you are doing the things that you have already specialised in,” says Germine.

AVRICALAWY

FORTIES

Pay attention!

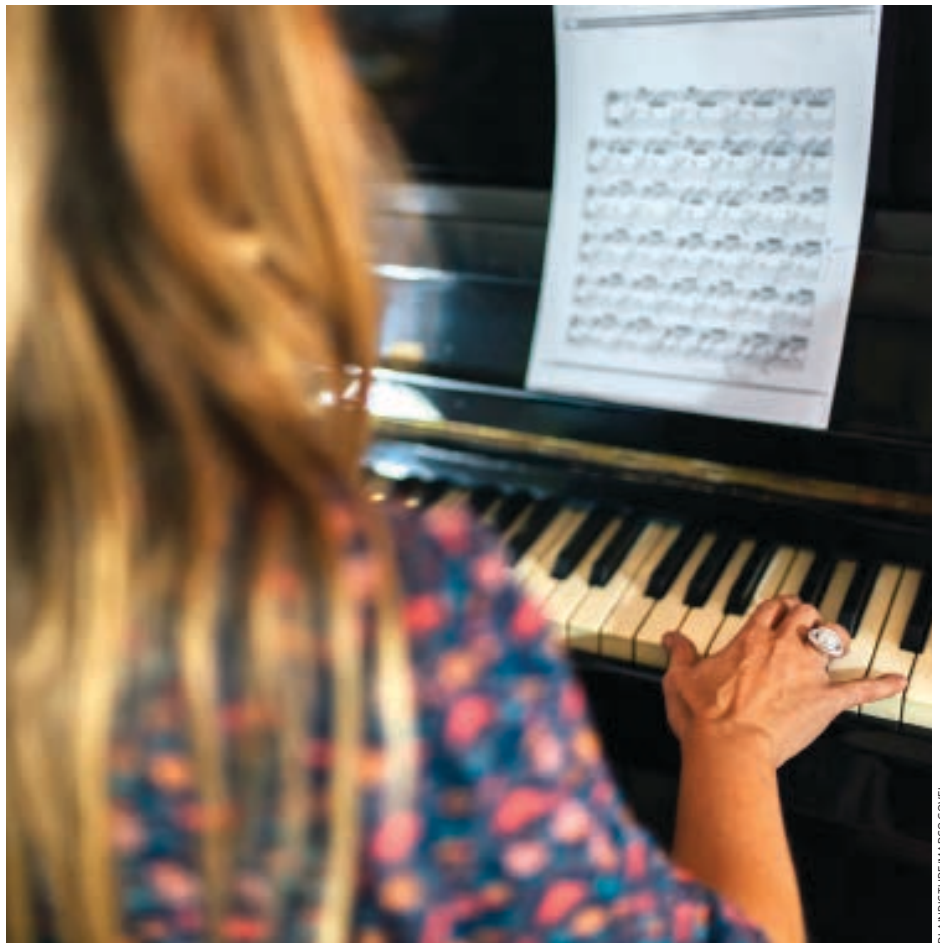
“The really frightening thing about middle age,” the actor and singer Doris Day is said to have quipped, “is that you know you’ll grow out of it.” We may gallantly try to claim that life begins at 40 – but for many people, it can feel more like the beginning of the end.

Midlife wasn’t always seen this way. In Renaissance paintings depicting the stages of life, you often see the decade symbolised as a lion, a sign of courage and strength. It isn’t clear why we have a more negative view today, but Margie Lachman, director of the lifespan development lab at Brandeis University in Massachusetts, suggests it may be linked to the pressures that begin piling up in our 30s. “Midlife is a period of high stress today, more so than in the past,” she says. “One is literally in the middle of work and family careers. This can take a toll on one’s ability to focus on one’s own well-being.”

There are, however, many reasons to feel positive about this pivotal period. Germine’s studies have included the famous “mind in the eyes” test, for instance, which gets people to infer emotional states from small differences in facial expressions. She found that people in their late 40s scored highest. This may be due to practice, she suggests. “When you think about the amount of social nuance that one has to learn across the lifespan – that’s where we think that comes from.”

Germine found similar patterns in a task demanding sustained attention. In this, the participants had to watch different scenes fade into one another and adapt their response according to what they saw – pressing a space bar when they saw a city and releasing it when they saw a mountain. Despite the effort (and potential tedium) of the task, 40-somethings found it much easier to “get into the zone” than younger people.

It is interesting to note that middle-aged people frequently bring in the most supplies in traditional hunter-gatherer societies. According to various anthropological studies, hunter-gatherers often take decades to learn their skills, and these abilities continue to grow into their 40s.



PLAINPICTURE/MARGO GOVEL

Continuing to master new skills throughout life boosts brain health

There are some downsides to hitting this age, of course. Our skin tends to lose some of its elasticity and our body fat starts to be redistributed around the midriff. But after a dip in life satisfaction, happiness is already set to rise at the end of this decade and the beginning of the next.

Contrary to popular opinion, humans seem to have evolved to flourish into middle age and beyond.

FIFTIES AND SIXTIES

Crystallising intelligence

Unless you are extremely lucky, your body will have started to slow down by your 50s and 60s. But that is no reason to stop caring for your health. A growing number of studies show that our psychological outlook and physical lifestyle continue to have enormous consequences in later life. “To a large extent, the way one ages is in one’s own hands,” says Lachman.

Scientists didn’t always promote the benefits of exercise in later life. With the assumption that this was a time of inevitable decay, people

were generally encouraged to take it easy. “We used to think vigorous exercise would be dangerous for older adults, that they might suffer a heart attack or fall or break bones,” says Lachman.

Lachman’s own research has helped to change these views. In the middle of the 1990s, her team began following more than 3000 people aged between 32 and 84. Over the course of a decade, the participants’ general health was measured as well as three potentially protective factors: their physical activity, their social support and their sense of control over their life.

In terms of overall health, Lachman found that those in their 50s and 60s who scored well on those three factors looked much more like those who were in their 30s to 40s in the study than people of their own age.

The potential for interventions is obvious. “Promoting group exercise or sharing one’s exercise successes with friends and family can be a way to increase activity and social support, both of which are beneficial for health,” says Lachman. Talking therapies, meanwhile, might help to change people’s sense of control, encouraging them to see the potential to make positive change in their lives.

We can be similarly proactive about our cognitive functioning. According to Germine’s studies, measures of “crystallised intelligence” – the knowledge, facts and skills that we accumulate through life, such as vocabulary size – peak in our 50s and 60s. That should give you greater expressive power than those in their 20s or 30s. This accumulation of knowledge might also be responsible for some of the reduced processing speed of older people measured in cognitive tests. After all, when recalling information, it takes longer when you have more information to sift through.

You may, of course, encounter the odd moments of forgetfulness. But research by Dayna Touron at the University of North Carolina, Greensboro, suggests that older people are overly pessimistic about the state of their memory, which can needlessly discourage them from exercising their minds. When driving, for instance, they may use a GPS for fear of forgetting directions; yet they often

“To a large extent, the way you age is in your own hands”

can remember the correct route when pressed.

This habit, called memory avoidance, could speed decline, so it is important not to let pessimistic judgements become a self-fulfilling prophecy. Fortunately, there is now plenty of evidence that people who continue to learn new, challenging skills tend to maintain healthier brains in later life. This could be learning a language or musical instrument or a craft like quilting – anything that is complex enough to tax your mind.

With our brains as well as our bodies, it really is a case of use it or lose it.



It is never too late to reap the benefits of getting stronger

SEVENTY-PLUS The older the...

If you want to remain healthy, then regular, challenging activity is essential into your 70s and beyond. “It is never too late to make some changes,” says Lachman. One study, for instance, found that a programme of strength training improved the mobility of people in their 90s. At the same time, you might come to appreciate the wisdom that has accrued during your life and try to put it to good use.

This may sound like a cliché, but Igor Grossmann at the University of Waterloo in Canada, has designed tests that measure various elements of “wise reasoning”, and the age-related changes are revealing. In a typical test, participants are presented with a text describing a conflict – either personal or political – and asked to discuss the potential outcomes. Their answers are then scored on qualities such as intellectual humility (the capacity to admit what we don’t know), the ability to adopt many perspectives and the ability to find a compromise. Together, these traits are believed to capture the general concept of wisdom that has been promoted by philosophers throughout the ages.

Grossmann has found that people’s wise reasoning scores are often more strongly linked with various measures of life satisfaction and the quality of people’s social relationships, than traditional measures of cognitive ability like IQ. And older people seem to ace these tests compared with younger or middle-aged participants. The overall quality of our decision-making really does seem to increase steadily throughout life.

Our impressive abilities at all seven ages of life make it clear that there simply is no single prime period: every decade could be considered a golden age in one form or another. From our entrance into this world to our exit, humans have great potential. ■



David Robson is author of *The Intelligence Trap: Revolutionise your thinking and make wiser decisions*. To buy a copy, go to shop.newscientist.com/the-intelligence-trap