The science of sleep, work, diet, rest, love, exercise, living

219 reasons to rethink your daily routine

DR STUART FARRIMOND

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Foreword

"Science". If the word brings to mind dreary lessons, mumbo-jumbo jargon, and bookish bores who are no fun at a party, then this book is for you. All too often we think that science means distilling our world into dry numbers and equations. In reality, science gives richness, meaning, and depth to our daily lives. In my seven years in medicine, I not only learnt the intricacies of the human body and the diseases that afflict it, I was moulded into the role of a doctor and taught to skilfully hide behind a cloak of jargon and science-speak. It was only after stepping back from the profession that I discovered how truly alienated we academic types can make others feel. Much of this highbrow babble does nothing but separate us from others. This book seeks to set the record straight and show that you do not need letters after your name to understand life's little mysteries.

Every day brings with it countless questions. Not just the philosophical ones, but also momentary wonderings – should I drink a coffee first thing in the morning or wait a while? Why are there so many bad drivers on the road? Why do I feel so sluggish after lunch? Newspaper columns and clickbait websites are filled with pithy answers to such questions. Many of these explanations leave us wanting. They may sound reasonable, but sometimes they're misleading or just plain wrong.

Dozens of specialists and experts from around the world have helped me craft this book, which represents the most up-to-date science and research that answers these questions. Rather than serve you up feel-good self-help fluff with every answer, I hope to explain the science in a way that everybody will understand and so be empowered to make better decisions.

I take you through a typical day – morning, afternoon, evening, and night – answering those "I wonder why?" questions when they are most likely to crop up. Of course, not everything fits neatly into a timeslot, and you may do things at different times; for example, some prefer to exercise at the crack of dawn, others in the evening. I hope this helps you to navigate through your day. I have also tried to make the book relevant, regardless of your age, gender, race, creed, and culture.

Above all, this book is a celebration of life. It is the most precious thing we have. Life deserves to be filled with laughter, love, kindness, and passion. Yet it is desperately fragile. I think that we only really appreciate just how wonderful life is when we go face-to-face with the reality that ours will one day come to an end. It is only when we realize that our existence is but a grain of sand in the infinity of time, that we learn to truly relish every day we have on planet Earth. The COVID-19 pandemic has brought this uncomfortable truth into sharp focus to all of us. During the writing of this book I have endured surgery, radiotherapy, and chemotherapy for what has now become an aggressive brain cancer. It is with the steadfast love and support of family and friends that I have learnt to love life. Writing this book has helped me live life to its fullest. I hope that in reading it, it helps you live yours to the fullest, too.

Stuart Farrimond

MORNING

Nature really has no sense of manners. Starting before sunrise, birds tweet and warble at a volume loud enough to unsettle even the heaviest sleeper. Just like our feathered neighbours, we have a body clock that wakes us in the morning. At its command, our internal systems flutter into life and our brain steadily becomes primed to focus on the day's business. You may not have the sparkle of a sparrow, but the same energizing hormones flood through your blood, enabling you to fly headlong into the new day.

Why is waking up so hard?

Many body systems, from the digestive tract to the thinking regions of your brain, rest as you sleep. Getting the motors running again can be like starting a car on a frosty morning.

When you sleep, your body cycles repeatedly through a natural rhythm of sleep stages. If you are lucky enough to wake during a good dream (during an REM stage), expect to wake energized. However, if you wake from deep, dreamless sleep (during a non-REM stage), you will likely feel groggy, starting the day with the mental vigour of a slug.

When you wake suddenly from deep sleep, rather than rising naturally (see page 15), the frontal thinking parts of your brain aren't ready to spark into life; instead they are straining to shift into normal thinking activities. This brain lag is called sleep inertia and has several effects: your reaction times are terrible, thinking and reasoning are muddy, and memory is at its worst. You will also suffer worse sleep inertia if you're sleep deprived – and spritely morning larks aren't immune to its effects, either.

Sleep inertia is common, but thankfully it's temporary, and only lasts for the first hour or two of the day. There are techniques (see left) that you can try to ease its effects.

70% OF PEOPLE EXPERIENCE **SLEEP INERTIA** FOR THE **FIRST HOUR OR TWO** OF THEIR DAY

FEELING GROGGY THIS MORNING?

1

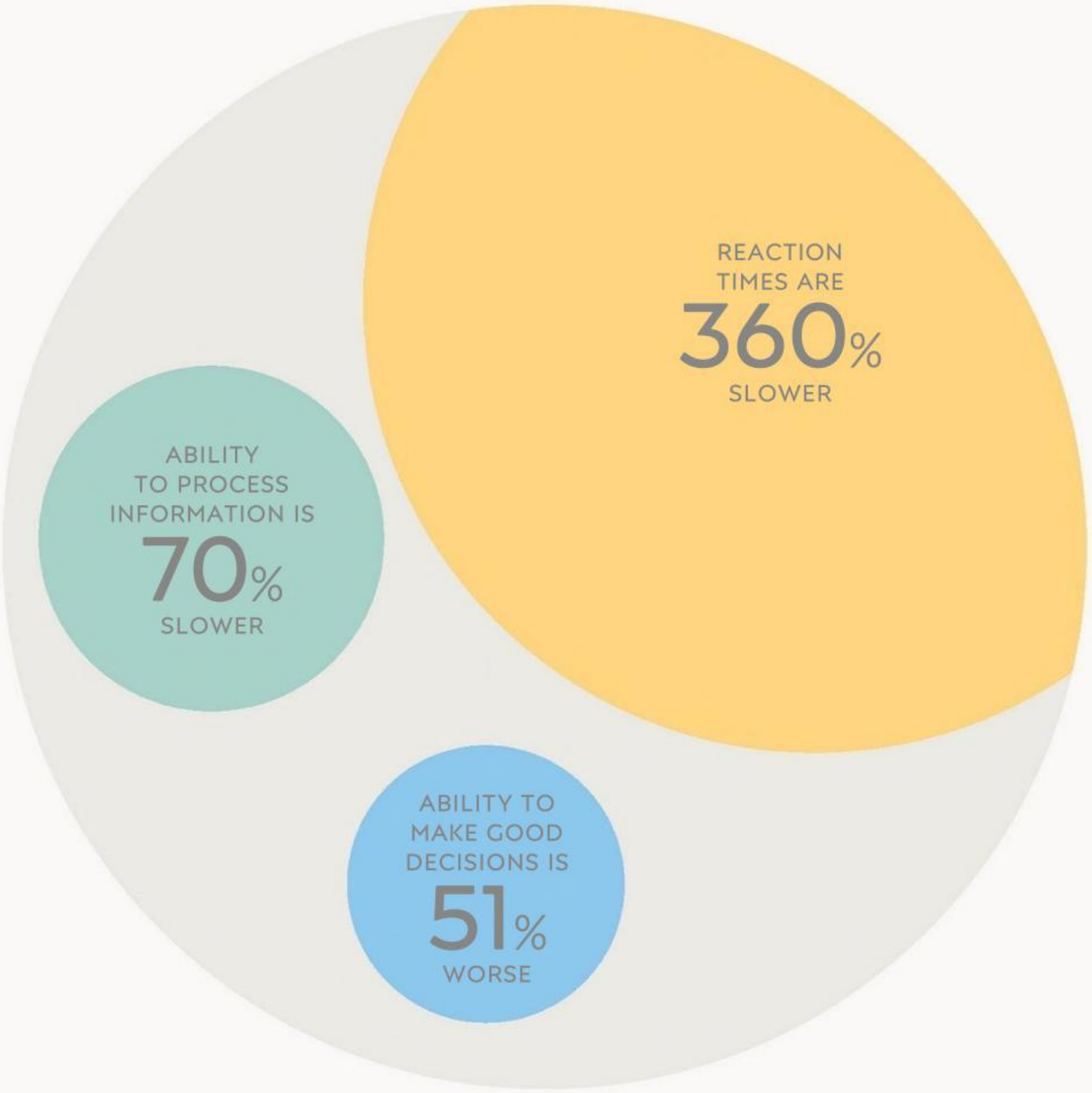
GET OUT INTO DAYLIGHT to kickstart your body clock and boost levels of "wake up" hormones (see pages 22–23).

2

TRY STRETCHING, YOGA, AND GENTLE EXERCISE, such as a brisk walk or cycle ride – these all increase your heart rate, improve blood flow to the parts of your brain that are still "asleep", and boost your mood.

3

DON'T MAKE BIG DECISIONS because you won't make the best choices, even if you think you're clear-headed.



SLOW START

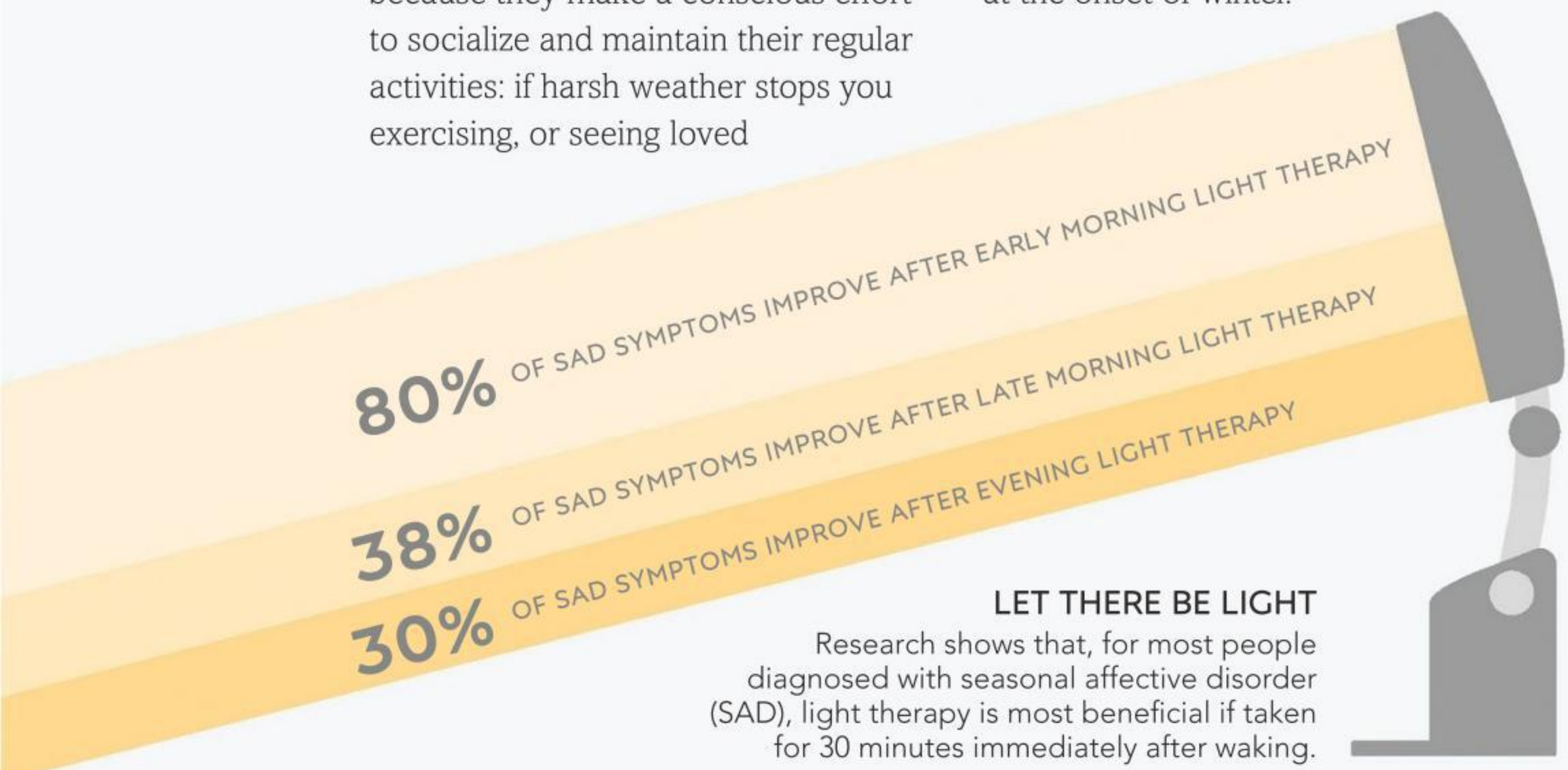
People who are abruptly awoken and experience sleep inertia have lowered reaction times and decision-making abilities. In several studies, most cognitive functions were impaired immediately after waking.

Why do I feel low on winter mornings?

If a miserable mood seems to go hand-in-glove with short, chilly winter days, then you aren't alone: many people are more sleepy and have less energy during winter time.

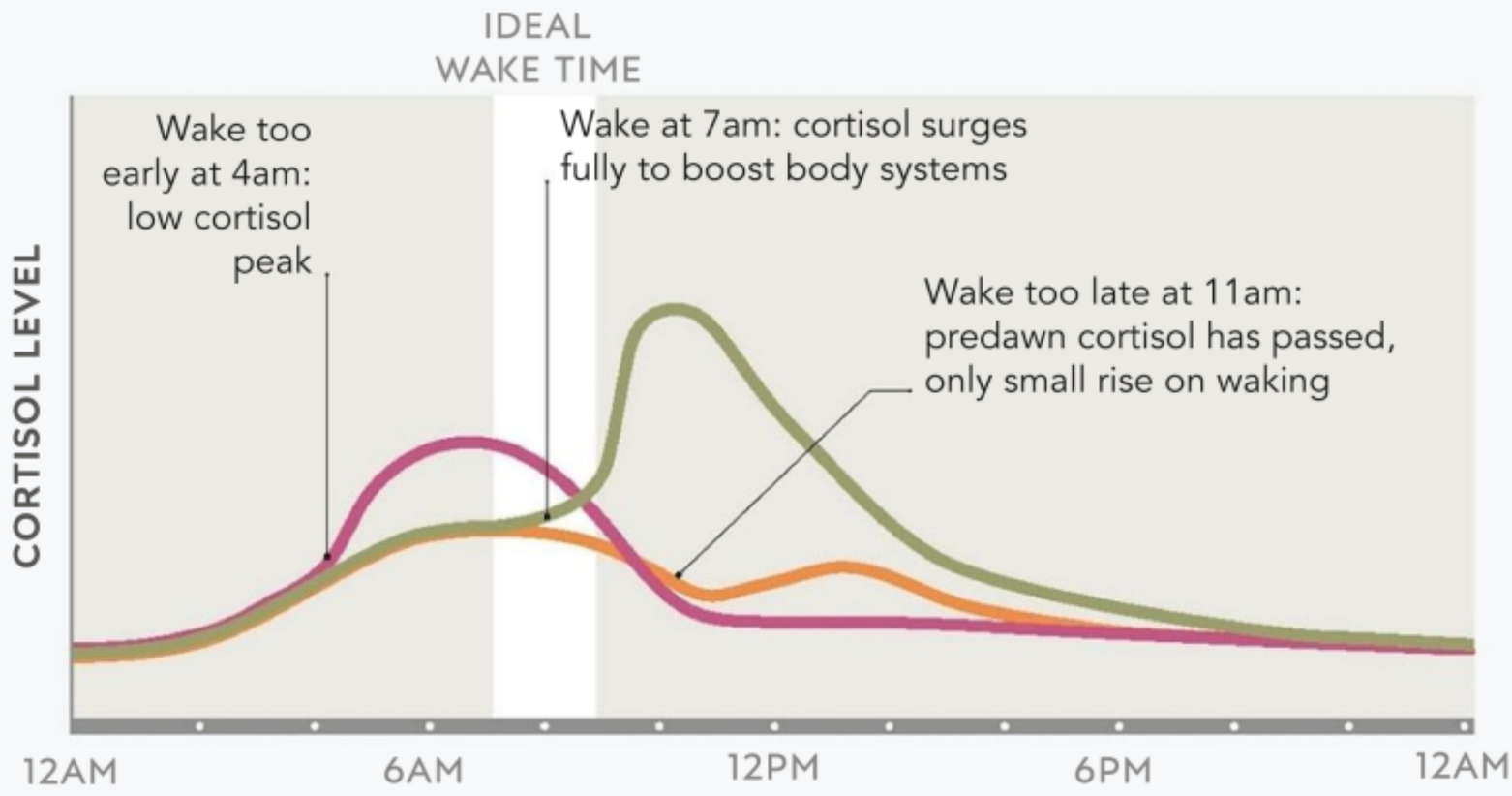
Some scientists think that during darker, winter days, a lack of sunlight hitting the eyes tricks your body clock into generating an excess of its natural sleep hormone melatonin, vaporizing your regular happy sparkle. However, other studies have cast doubt on this theory, by showing that people living in polar regions who face dark days for half the year don't tend to suffer from persistent low mood. This may be because they make a conscious effort to socialize and maintain their regular activities: if harsh weather stops you exercising, or seeing loved ones, and keeps you cooped up indoors like a hibernating bear, then your mental wellbeing will almost certainly take a hit.

If you suffer winter blues, light therapy – a daily dose of artificial light – has been shown to be effective. And perhaps if we take a lead from the Scandinavians, who see cold seasons as a chance to see more of friends and family, we may feel less gloomy at the onset of winter.



LET THERE BE LIGHT

Research shows that, for most people diagnosed with seasonal affective disorder (SAD), light therapy is most beneficial if taken for 30 minutes immediately after waking.



LET CORTISOL HELP

The graph shows how your cortisol peaks differently, according to when in your sleep cycle you wake up. If you get up at your natural waking time (green line), you'll feel its full benefit.

I had a lie in, so why do I still feel sleepy?

When you wake after a longer-than-usual night's sleep, you expect to feel refreshed, so it's baffling when instead you feel even worse than on a normal morning.

Your body has a fixed sleep-wake rhythm (see pages 22–23), and it starts to rev up your biological engines way in advance of the ordeal of waking. Long before your natural waking time, the powerful energizing hormone cortisol is released into your blood in increasing amounts. Cortisol boosts energy and motivation, and increases the level of blood sugar in order to fuel the brain and muscles and get you moving. The moment you wake up, cortisol surges even further, helping to hurl you into the land of the living. If you sleep through your early-morning cortisol buzz, the normally-invigorating hormone ebbs away uselessly, and you don't have its energizing benefits when you do wake. This is why a weekend lie in can actually leave you feeling worse than an early start on a working day.

It is possible to catch up on some lost sleep at the weekend, but you can only expect to reclaim half of the deficit (see page 231). It's best to go to bed and wake up at the same time every day, so that your body clock can naturally take you through the morning.

Should I hit the snooze button?

The most effective alarms are noisy and harsh. They are foolproof because they trigger a primal bodily fear response. In short, they give you a touch of morning terror.

That loud morning buzzer triggers instinctive survival responses in an area deep in the brain called the amygdala. Your heart rate soars as cortisol (see page 15) and the fight-or-flight hormone adrenaline stream through the body – just in case you need to run for your life. Clearly there is no wild beast about to pounce and when your conscious mind realizes this, the adrenaline surge fades and you may doze off again. But hit the snooze button and you are about to add insult to injury. An extra 10–15 minutes simply is not long enough for you to be able to sink back into a refreshing sleep. When the alarm shocks you awake, you suffer the same biological torment all over again. Repeated surges of fear-fuelled adrenaline may well force you out of bed, but over time can put your mood on a downer and affect your physical health: years of stressful wakenings actually contribute to the clogging of blood vessels, which can in turn increase the risk of heart problems.

It's best to set the alarm for your desired waking time, then get up right away. If you really want that extra snooze, at least allow yourself 45 minutes to reap some benefit. Or see left for tricks and tips to help reduce your reliance on the dreaded alarm.

IF YOU MUST **SNOOZE,** ALLOW AT LEAST **45 MINUTES** BETWEEN ALERTS

WANT TO **BEAT THE ALARM?**

1

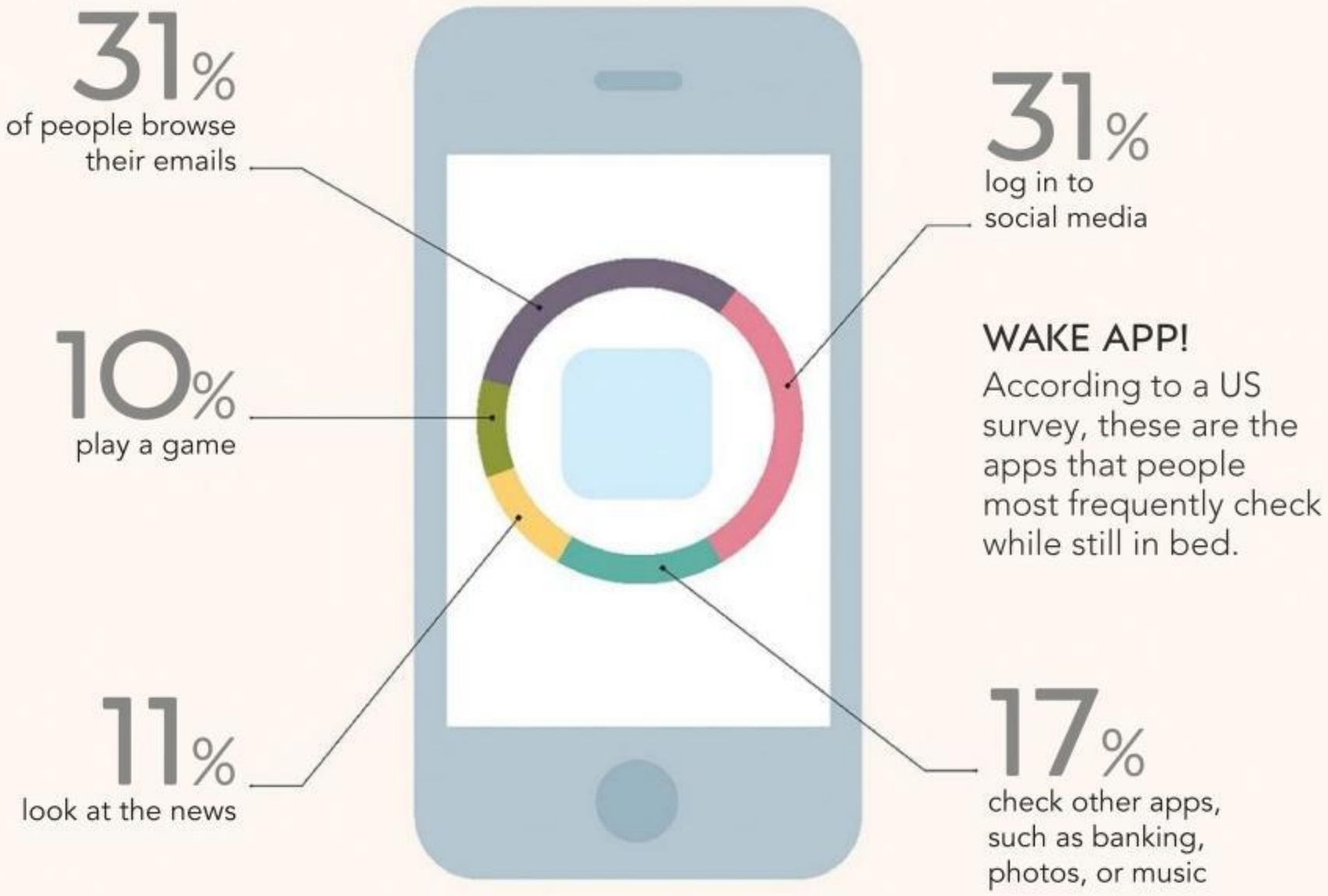
LEAVE THE CURTAINS OPEN OVERNIGHT to allow daylight into your bedroom as early as possible; sensors in the back of the eye detect the dawn through your eyelids, priming the body clock for morning.

2

SET THE CENTRAL HEATING to come on at least half an hour before you wake, to mimic the temperature change as the sun rises.

3

RIG A TIME SWITCH TO YOUR BEDSIDE LAMP and fit a "daylight" bulb; set it for half an hour before the alarm to jumpstart the cortisol surge.



Is it OK to check my phone as soon as I wake?

It's no wonder we can't resist: with news, emails, games, and social media, our smartphones are a mental Aladdin's cave. But is swiping and tapping really the best start to the day?

You're vulnerable when you first wake up – the logical, thinking parts of your brain take a while to become fully awake, and you're less able to make good decisions, handle new information, and solve problems. Open apps such as emails and to-do lists in the first hour and you risk getting out of bed on the wrong side, as research shows that these can trigger anxiety.

Your focus then quickly becomes blinkered, further muddying your shaky morning judgement and potentially pushing up your already-surging cortisol to unhealthy peaks.

If you're a first-thing phone-checker, consider moving troubling apps away from your home screen. Fill these prime spots instead with apps that offer relaxing or uplifting content.

Why don't I remember my dreams?

Your dreams have more excitement, emotion, and terror than any Hollywood blockbuster, but unfortunately your brain's memory reel isn't running.

Everyone dreams – even the 5% who say they never do. Almost all of your dreams happen when in a stage of sleep called REM (also known as Rapid Eye Movement). During this stage, much of your brain is very active, almost exactly as if you were awake. Come sunrise, though, usually most memories of your dreams will have mysteriously vaporized.

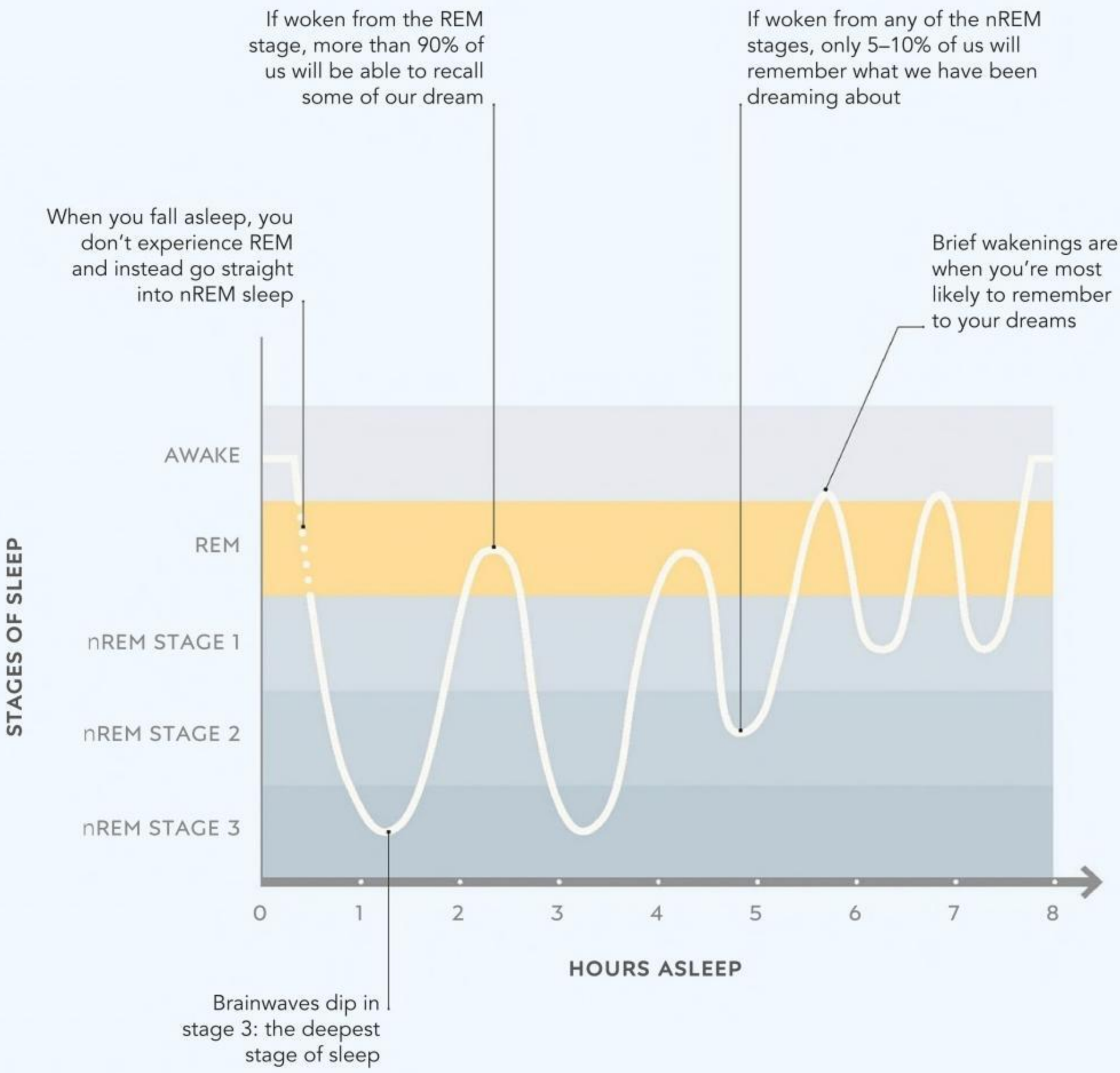
25%
– THE **PROPORTION** OF A TOTAL NIGHT'S **DREAMS** THAT WE ARE **ABLE TO RECALL**

When you dream, your memory storage capabilities, centred around a brain region called the hippocampus, are dialled right back – so most of your bizarre night-time experiences are as fleeting as a shooting star. It seems to be that the hippocampus opts not to store most dreams because it deems them irrelevant compared to the real events that are worth remembering in your waking life. However, people (including young children) who might attach significance to their dreams are more likely to remember them.

If you wake up during REM sleep, then you will probably be able to describe what was happening in your dream at that very moment. Your memory circuitry will still be sluggish at that time, so to help embed dreams in your longer-term memory, record them on a notepad or phone straight away before they fade. Studies show that the act of recording your dream helps you recall visual details.

You can also increase your chances of recalling dreams by timing your alarm to go off in the REM stage and make it more likely that you'll wake up mid-dream.

If you can't remember your dreams, there's no cause for worry – it just shows your brain is giving your memory a much-needed rest.



SURFING THE BRAINWAVES

When you sleep, brainwaves dip in and out of four different stages. Most of your sleep (75–80%) is spent in the calm, restorative non-REM stages, while the rest you spend in REM, where most of your dreams occur. You're much more likely to remember your dreams if you wake from REM sleep.

When should I drink my first coffee?

If you reach for a cup of coffee first thing in the morning, then count yourself as one of the millions who use caffeine to kickstart their day. But does it help or hinder you?

Caffeine is a powerful stimulant: it speeds up thinking, boosts motivation, and lifts mood, but it does so by temporarily blocking one of the body's naturally calming brain hormones – adenosine. Within 10 minutes of slurping your early-morning beverage, caffeine is coursing through your blood and sets to work on your brain by blocking adenosine. But the problem is that, at this time, the energizing hormone cortisol is at its peak, while adenosine is at its lowest. A strong coffee or tea on top of all that cortisol doesn't make you more alert – it simply throws a few matches onto an already raging bonfire, increasing your chances of anxiety and jitteriness. Your espresso is worse than pointless.

You're much better off waiting a few hours until cortisol has waned and adenosine has started to rise, and then you can reap the full benefit of caffeine's boost.

CAFFEINE FIX

The best time to reap the energizing rewards of caffeine is in the 2–4 hour window after waking, when cortisol falls away and adenosine starts to rise.

KEY

- Cortisol
- Adenosine
- Sleep urge

> If you drink a **strong coffee** in the **first hour** of **waking**, you are **pouring** much of its **potency down the sink**.

Why are teenagers so lazy in the mornings?

You can blame them for a messy bedroom, but you can't scold teens for their reluctance to get out of bed in the morning – their body clocks are changing.

During the tumultuous teen years, hormones are surging and the body is changing dramatically. Meanwhile, large swathes of the brain are rewiring (see pages 118–119).

One of the side-effects of this biological turmoil is that a teenager's body clock moves forward. As a result, they become more inclined to go to sleep later and also wake up later. They aren't just being lazy – their body really is in a different time zone! For a typical 16-year-old, 10pm feels like your 8pm and a 7am alarm carries the pain of an adult's 5am disturbance.

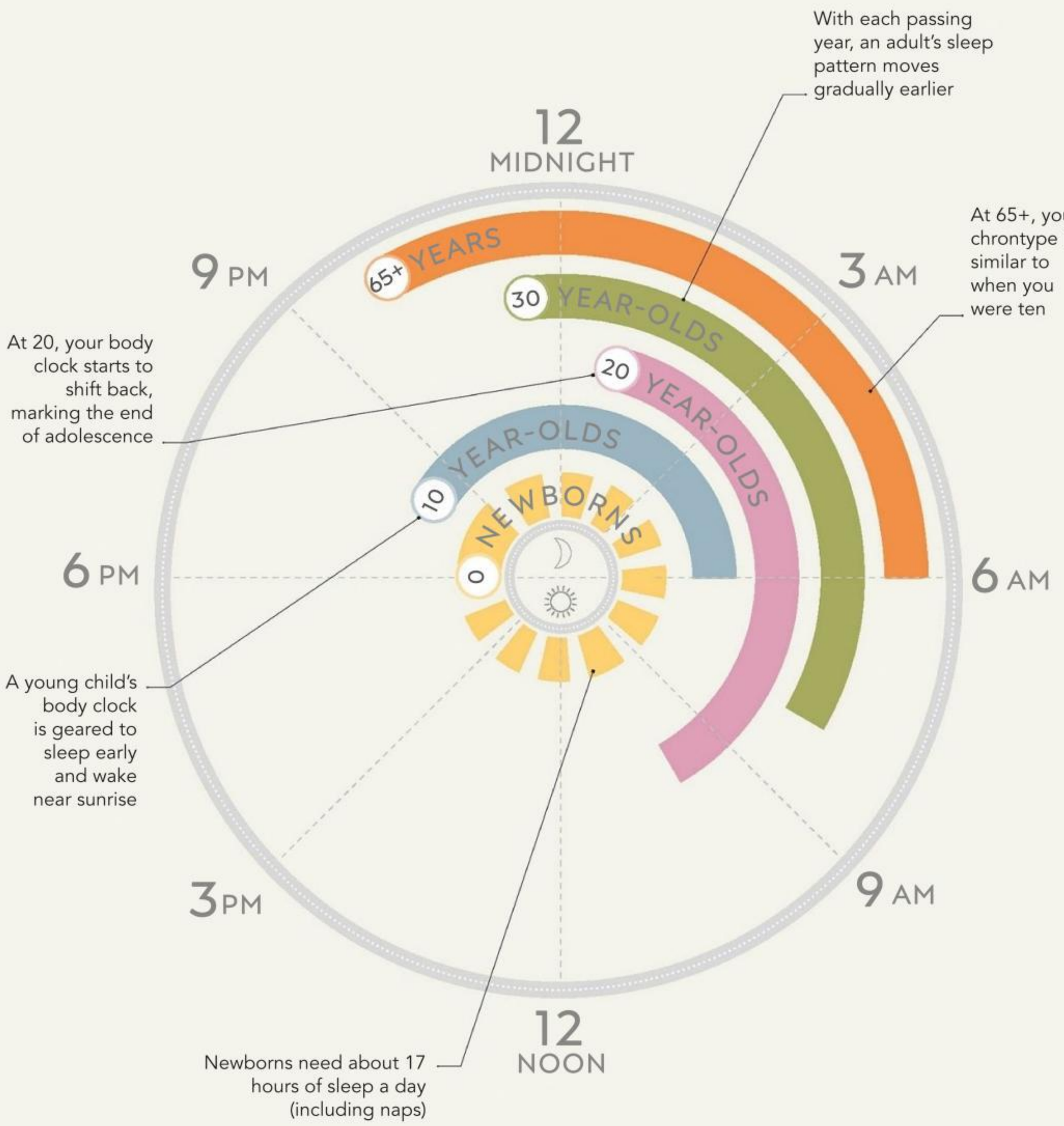
No one knows exactly why the adolescent's body clock makes this two-hour shift, but it's an inescapable result of the child brain maturing into an adult one. Interestingly, similar changes happen after puberty in other animals, including monkeys and mice.

When a teenager lives in a world of 8:30am starts, they will become progressively more sleep deprived – going to sleep late yet still being forced to get up at "adult time". When the weekend comes, it's normal for teenagers to have marathon sleep-ins to try to compensate.

A teenager's brain tends to be foggier during the morning, so some schools have experimented with later start times and moving the most mentally taxing subjects to later in the day. This has generally proved successful, with attendance rates, sickness, and academic performance all improving.

So go easy on teens – for a number of years, they will be going through a perpetual jetlag of sorts. The body clock is at its latest when you get to 20, and thereafter it slides back with each passing year.

STUDIES SHOW THAT **STARTING** THE **SCHOOL DAY** AN **HOUR LATER** IMPROVES TEENS' ACHIEVEMENT BY 10%



SHIFTING SLEEP TIMES

As you age, your body clock shifts back and forth. For most of your life, you tend to go to sleep between 9–11pm and wake at sunrise. However, throughout the teen years, the body clock temporarily changes to run much later.

When's the best time to shower or bathe?

Most of us wash every day, and we have our preferred methods, but how and when you do should really depend on whether you're revving up or winding down.

For a morning wake-up call, a cold shower is usually best – a splash of chilly water over the body makes levels of cortisol and adrenaline surge briefly, giving as much punch as a caffeine-hit. If stepping into an icy-cold shower first thing is just unbearable, try ending a warm shower with a 30-second blast of cold water: this will deliver an invigorating boost and – according to one large study – it will even make it less likely that you'll take time off sick from work.

STAY **CLEAN AND FRESH**

1

TAKE A COLD SHOWER in the morning to give both body and mind a wake-up boost.

2

TAKE A HOT SHOWER OR BATH in the evening to calm your mind so that you prepare for sleep.

3

BATHE OR SHOWER no more than once a day so that you don't wash away your skin and hair's natural oils.

If a good night's sleep is your goal, then a warm shower or bath about 90 minutes before bed is highly effective in helping the body and brain wind down: this lowers blood pressure, stimulates the release of the positive, happiness hormone serotonin, lowers anxiety levels, and can make cortisol levels plunge by a third. A cold shower has the opposite effect, so is best avoided late in the evenings.

Of course, you might think that you can cash in on all the benefits with a morning shower and an evening bath. Rinse that thought: dermatologists say that twice-a-day bathing is probably too much. Your skin and hair are coated in a barely visible sheen of an oily substance called sebum. This is your body's natural waterproof gloss, and it's constantly replenished via microscopic pores in your skin. Washing twice a day scrubs away the skin's sebum, and without it your skin will dry out and become sore, chapped, or infected. Bath-lovers, beware – long, hot soaks in a tub of bubbles feels luxurious, but it's best to shower or

bathe for only about 5–10 minutes in lukewarm water every two or three days to give time for sebum to replenish itself.

In our overly washed and manicured world, skin and hair can become so depleted of their natural oils that we think we need moisturizing creams and lotions to restore their lustre. Much of what you might slather over yourself is, however, nothing more than nice-smelling grease. Moisturizers don't actually "moisturize" – they simply replace the oily protective coat that

STRESS HORMONE

CORTISOL PLUNGES BY A THIRD WHEN YOU'RE IMMERSED IN **HOT WATER**

you wash down the plughole with your soap or shampoo. Added "skin nourishing" ingredients emblazoned on the packaging are mostly marketing froth that have little added effect.

Similarly, hair conditioners are merely a replacement for the natural oils that the body freely makes. If you shower or bathe every two or three days, you likely won't need skin moisturizers or hair conditioners.

SINGING IN THE SHOWER IS GOOD FOR YOU!

As the bathroom windows steam up, an audience of silent yellow rubber ducks stare in awe at your rendition of *Fly Me To The Moon*. Frank Sinatra never sounded this good – at least to your own ears!

Emotions and music are knotted in your brain tighter than the mess of cables behind your television. You really do "feel" music because the emotional areas of your brain (called the limbic system) become active when you sing cheery songs.

Also, you genuinely sound better in your bathroom: the tiled surfaces echo vocal pitches back and forth, reverberating each crooning note to last slightly longer, smoothing out a wobbly voice and masking any off-notes. You're also louder, which no doubt helps to boost your mood even further. Some artists have even made commercial recordings in their bathroom because the acoustics are so good.

Your soapy serenade will also be deeper and throatier in the morning. While you haven't been speaking overnight, your vocal cords relax themselves, much like a guitarist might release the tension from their guitar's string.

It's such a pity the duckies are the only ones to realize just how great a singer you truly are...

contains the circuitry most responsible for the brain's "executive" functions – its thinking.

Procedural memory
Scientific term for "muscle memory" – centred in the cerebellum associated with habitual behaviours that require little conscious thought.

Protein
Key nutrient used in tissue repair, muscle growth, and hormone production. Most plentiful in meat, eggs, soybeans, and nuts.

Reticular activating system
(RAS) Brain network that controls whether we are awake and alert or asleep.

REM and nREM sleep
REM is the rapid eye movement stage of sleep, when the brain is as active as when awake and may be dreaming. During nREM [non-REM] sleep, brain activity is calmer and more organized.

Salience network
The "watching" network of the brain's circuitry. Triggered by distraction, it makes us vigilant to sudden changes and prepares us for action.

Saturated fat
Fats that are typically solid at room temperature. High intake leads to atherosclerosis – furring up of arteries.

Serotonin
Neurotransmitter that plays a role in happiness and wellbeing.

Sleep inertia
Grogginess typically felt when roused from deep sleep.

Spatial cortex
See Parietal cortex.

Starch
Carbohydrate found in plant-based foods such as potatoes, corn, and rice, which is broken down into sugars.

Stress response
Sequence of body changes that happen when put under threat. The fight-or-flight response is one part of the stress response.

Temporal lobe
Large area in the brain containing the limbic system. Important in memory, language, and vision.

Testosterone
Male sex hormone. Increases sex drive, aggression, and muscle growth. Prompts male sexual development. Present in females in lower levels.

Trans fat
Very unhealthy type of fat, synthesized from unsaturated fats and used in some processed foods.

Unsaturated fat
Fats that are typically liquid at room temperature. Found in fish and plant oils and essential for good health.

Vasopressin
Calming hormone and neurotransmitter produced in the hypothalamus. Works alongside oxytocin to encourage people to bond.

VLPO
Ventrolateral preoptic nucleus – a tiny brain area close to the hypothalamus, it releases neurotransmitters that encourage sleep.

"Wandering" network
See Default mode network.

"Watching" network
See Salience network.

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