

Matt Walker: Sleeping Enough to Be Truly Awake by Awakin Call Editors

“The evidence is overwhelming, it is irrefutable. Sleep is the single most effective thing you can do to reset your brain and body health each and every day,” -- Matt Walker, Professor of Neuroscience and Psychology at the University of California, Berkeley, and Director of the Sleep and Neuroimaging Laboratory.

Calling the global sleep-loss epidemic “the greatest public health challenge we now face in the 21st century,” Walker examines the impact of sleep on human brain function in healthy and clinical populations. Through his work at UC Berkeley, he has been at the forefront of sleep research. He has linked sleep deprivation to psychiatric disorders, obesity, risky behavior, post-traumatic stress disorder, learning, and memory loss in old age. And recently, his research demonstrates that a poor night’s sleep may also hinder one’s ability to accurately read the emotions of others – an impairment that may have wide-ranging consequences for our social interactions. “Few things come unhinged as quickly and profoundly as our emotional stability...when we are not getting enough sleep,” What follows is the edited transcript of an Awakin Call interview with Matt Walker, moderated by Aryae Coopersmith. You can read or listen to the full version of the interview [here](#).

Aryae Coopersmith: Would you start off by talking a little bit about what is sleep and the different issues and ways we deal with sleeping?

Matt Walker: “What is sleep?” That is such a critical question. I think many of us believe that we lose consciousness, and our brain is dormant and our body gets a little bit of rest, and gets some recharging, and then we wake up. So what is the harm if we short change our sleep by going to bed late or waking up a little too early with an alarm clock?

Sleep is not a dormant state. It is an incredibly active state in the brain and body. There are some parts of your brain that are up to 30% more active in some stages of sleep relative to when you are awake.

There are two principal stages of sleep that we cycle through when we are asleep that many people might have learned about. One of them is non rapid eye movement sleep or non-REM sleep. The other is rapid eye movement sleep or REM sleep, which is commonly associated with dreaming.

You ebb and flow through a cycle of REM to non-REM sleep every 90 minutes. You will replay that 90 minute cycle every 90 minutes throughout the night. It is an incredible

cerebral war that is won and lost between these two stages of sleep.

What is interesting is that although that 90-minute cycle of non-REM to REM is stable across the night, the ratio balances of REM to non-REM sleep changes as you move across the night. So in the first half of the night the majority of those 90-minute cycles is comprised of that deep non-REM sleep.

As you push through the second half of the night, now that seesaw balance actually changes. And instead much more of those 90-minute cycles are composed of rapid eye movement sleep and a lot less deep non-REM sleep.

If you go to bed a little bit too late—perhaps an hour or two hours later than you normally would and you asked, “How much sleep have I lost compared to a normal eight hours?” You might think you have lost 25% of your sleep since you have gone to sleep 2 hours later than normal. I am going to wake up at the same time, so I only got six hours of sleep rather than eight. But that is not true. You didn’t just lose 25% of your sleep. You have probably lost up to 60 to 70% of your deep sleep. And it works the same way on the backend, too. We can’t afford to burn the candle at either one of those ends based on how sleep plays out throughout the night in terms of this canonical structure.

Over the past 10 years, through an explosion of the most wonderful science, we understand that there is no single process within your brain, and there is no single physiological process within the body, that is not powerfully enhanced when you get sleep or demonstrably impaired when you don’t get enough.

So now we’ve been forced to up-end the question in a way. Rather than asking “What is the function of sleep?”, we’ve been forced to ask, “Is there anything that does not benefit from sleep?” And the answer is no.

Aryae: The complexity of this is very interesting. I know that my own habits tend to be I’ve lost an hour or two of sleep tonight, so I’ll sleep an hour or two extra tomorrow night. My understanding of what you’re saying is that this will not catch me up?

Matt: No, this is one of the myths that are so critical for people to recognize and embrace. We’ve found no evidence that you get back all of the sleep that you lose. What I mean is that sleep is not like the bank. You cannot accumulate at debt and hope to pay it off at a later point in time.

Human beings are the only species that deprives themselves of sleep. No other species that we see will do this without biological gain. And what that means is that evolution has never faced the challenge of insufficient sleep since the dawn of time. As a consequence, Mother Nature has never had to solve this problem of insufficient sleep, so there is no safety net.

Aryae: What is the difference between sleep in a younger person and sleep in an older person?

Matt: There are two interesting questions there. When is and how is sleep different across the lifespan? And the second is how do older and younger adults deal with insufficient sleep?

In terms of sleep across the lifespan, there are just dramatic changes. Some of the most

dramatic changes happen in the first 18 to 24 months of life. Your sleep structure changes and you begin to stabilize. You start to have longer regular bouts of sleep. And then you start to have different types of sleep. An infant seems to have predominately rapid eye movement sleep and very little deep sleep. That seems to be common across almost every single mammal that we have studied. Then non-REM sleep starts to develop later in life. And we're not entirely sure why. Why is it that REM sleep dominates early in life? There's a theory that it's actually a critical igniter of brain development. That REM sleep or dream sleep sparks all of these neural pathways and makes them flourish. It is like an internet service provider in the brain that populates the brain with all of these high-speed broadband connections.

Then there's another dramatic change that happens in our sleep. And it happens right around adolescence. What we see is that sleep time preference changes. What I mean by that is that when you are a younger child, you want to stay up late, but it is nearly impossible. You fall asleep early and much to the chagrin of your parents, you wake up early. Once you hit adolescence a dramatic shift happens in what we call the 24-hour biological clock rhythm, or your circadian rhythm. What that means is that you now want to go to bed later and wake up later. And there is nothing you can do about it. No amount of parental ranting and raving is going to make you fall asleep as a teenager at 9 o'clock because you have to wake up at 6 a.m. the next morning to catch the bus. And that is one of the most profound tragedies of society in industrialized nations right now—the brute forcing of adolescent teen sleep against its biological natural tendency. And this is doing our youth a terrible disservice.

Then we maintain this regular sleep pattern in our mid-to-late twenties. But then, sadly, the great sleep depression comes—somewhere between your thirties and forties. If you were to come into my laboratory, we could measure the decline of your deep sleep quality. So even by the fourth or fifth decade of life, sleep starts to deteriorate.

By your seventies/eighties, it's actually really difficult for us to pick up really deep sleep. We've actually done work in the last five years to explore why. And it is even more profound in diseases like dementia, particularly in Alzheimer's disease. Very recently we've discovered that these two things that we very commonly associated with aging—poor memory or poor cognitive function and poor sleep—they aren't simply coincidental. They are, in fact, significantly interrelated. And the destruction of deep sleep in later life is perhaps one of the most under-appreciated factors that are contributing to what we call cognitive decline, and now it seems Alzheimer's disease as well.

So it is very difficult with aging. All signs point to the fact that sleep need remains just as high, but sleep-generating capacity is eroded and declines. In other words, the older adult brain cannot produce the sleep that it nevertheless still needs. We are now desperately trying to find innovative new ways to restore sleep in the elderly. It is one of the moonshot goals in my laboratory. Can we give back and boost and amplify deep sleep in older adults? And in doing so can we salvage aspects of learning and memory function? And can we start to fight back against disorders like Alzheimer's disease? That is the very real hope now.

Aryae: Would you tell us a little bit about the work that you're currently doing in the lab? And how is it helping you discover some of these new things about sleep?

Matt: The research that I perform in my lab has many different programs. Some of them are clinical. I'm not an M.D. by the way, and I don't pretend to be one or play

one in the public forum. I am a Ph.D. But we do work with clinical populations and psychological populations and patients with Alzheimer's and dementia. But we also do a lot of basic science research. We're still trying to uncover all of these nutritional benefits that sleep provides to the brain and body.

The explosion of research and understanding about sleep has been driven by technology. We have these new methods of brain science to explore sleep in ways that we never could before. We can measure patterns of brain wave activity during sleep. And we can also peer deep into the brain with things like MRI scanners as people are sleeping. We can look to see which parts of the brain are switching on and switching off. And we can also sort of decompose these brain wave patterns, and really understand their individual parts, like a prism where you're beaming white light and you can break it apart into its component shades and hues. By doing this we are able to speak in the currency of the brain which is in oscillations and brain waves and patterns of brain activity and networks of brain activity. And we are able to explore the body and find out more detail than we ever could before. We can look at genetics now through genetic screening—we can do blood draws; we can do measurements of heart rate and cardiac function, and we can start to unite all these things together. We can get a holistic view of the human while they sleep. And then we can see how that predicts the same set of measurements while they are awake. And then pattern match those two and then understand so much more about sleep. So it's been this revolution of new science and technology that allows us to understand these living organisms and live homosapiens included.

Aryae: Is there a particular focus of your research currently for this year—a particular direction that you are going?

Matt: We have several different areas at work that we are doing. For example, one of them is working with aging and Alzheimer's disease. Right now, based on work that is coming out of my lab and some other labs around the world, insufficient sleep across the lifetime is becoming one of the most important lifestyle factors determining whether or not you will develop Alzheimer's disease. This is an incredibly hot topic now. And it is bi-directional. What we now understand is at night during deep sleep the brain actually cleanses itself of toxins that have been building up during the day. It is important that people realize that wakefulness is low-level brain damage. And I don't mean to be an alarmist in saying that. It is simply a scientific fact. From all of this metabolic combustion and activity that happens when we're awake inside of the brain you build up excretory products just like in the rest of your body.

This system in your body, the sewerage system, is called the glymphatic system. At night is when that glymphatic system kicks into high gear. One of the things that this system clears out at night is this toxic protein called beta-amyloid, which is one of the leading factors that we believe causes Alzheimer's disease. Now we realize why insufficient sleep can set you on a trajectory path towards Alzheimer's. Because if you're not getting the deep sleep that you need throughout your life, you're not cleansing the brain of that toxic protein. Then we made a discovery that where that toxic protein builds up is not just in random places all over the brain. The Alzheimer's protein amyloid will actually develop in some parts of the brain and not in others. Now we understand that if you don't get that deep sleep at night, that toxic protein builds up in these deep sleep areas so you can't generate the deep sleep even if you allow yourself the chance to get it. So more of that toxic protein builds up and prevents us from getting the deep sleep that we subsequently need. And through this sort of spiral, it leads to what we know is an accelerated trajectory. That is one of the areas that is exciting for us right now.

Of course, one of the other features of that discovery is that there is a silver lining—in making this discovery that sleep is a new missing piece in the puzzle about Alzheimer’s. Yet it’s not the only one. Please don’t think that. There are many factors we know that contribute to Alzheimer’s. But sleep seems to be one unlike many of the other factors—changes, for example, in the blood flow dynamic of the brain or the chemistry of the brain—sleep is a particularly treatable target. We can actually do something about sleep. It is very difficult for us to change blood flow in the brain right now. Modern medicine doesn’t have the technology to do that. But we do have some new methods to change sleep, and one of the ways that we’re exploring is by electrical brain stimulation. We’ll try very small amounts of electricity in the brain. But if you pulse that electricity in time with those deep sleep brain waves I was describing, almost as if you’re singing in time with the natural rhythm of the brain, in young healthy adults you can amplify the size of those deep sleep brain waves. And you can almost double the amount of memory benefit that you get from sleep as a consequence.

So the question now is—can we translate the same techniques into older adults and those with dementia and give back that sleep?

Sleeping pills are not advised for the long term, and in fact, they are not advised as the primary method for treating poor sleep. Sleeping pills do not produce naturalistic sleep. If I were to show you the electrical read out of your brain while you are taking sleeping pills verses natural sleep, they are not the same. Those sleeping pills have been commonly called the sedative hypnotics and for good reason. Sedation is not sleep. Now I’m not going to argue that when you take those sleeping pills that you are awake at night. You are not. But to suggest that you are in naturalistic sleep is equally a falsehood. And now there’s some quite damning evidence of the use of sleeping pills and increased risk of mortality and increased risk of cancer.

There is hope here. There’s a new method called cognitive behavior therapy for insomnia. It is just as effective, if not more effective, than sleeping pills. You work with the therapist. It doesn’t require drugs. But better still its much longer lasting than sleeping pills. One of the problems with sleeping pills is that you start to use them and if you stop you have what’s called an insomnia rebound effect which is that you not only go back to having the poor sleep that you had before but your sleep is even worse due to drug tolerance and drug expectation.

So we’re looking at non-pharmacological ways to cure sleep in the elderly. We are not using drugs because right now the evidence isn’t strong enough to prove that they are beneficial. If we can find a drug that does improve sleep, and we can scientifically prove that, I will support it.

Mila from the UK: What’s one thing that we can do to salvage that lack of sleep in our older age? And why is it that some people have dementia and Alzheimer’s and others don’t? Does it mean that those who do have it have lost valuable sleep in their lifetime?

Matt: Two great questions. Firstly, in terms of sleep as we get older, there are several things that we can do. These are things that we call sleep hygiene.

Firstly, you can try to help regulate your rhythms. As you get older you actually start to regress back to childhood in terms of your sleep preference. You want to go to bed earlier and wake up earlier.

The other thing that older adults commonly do, which is a mistake is to fall asleep in the afternoon and evening. Here is the problem with that behavior. During the day when we are awake we build up something called sleep pressure. There is a chemical that builds up. The chemical is called adenosine. The longer you are awake, the more adenosine builds up. The more adenosine that builds up, the sleepier you feel. And after about sixteen hours of continued wakefulness, you are usually so sleepy that it's time to go to sleep. And you fall asleep naturally and easily.

When we sleep at night it is like a pressure valve on that cooker. We release and remove all of that adenosine. We clear it out. And then we wake up the next morning feeling refreshed, because we've removed those adenosines—that sleep pressure.

And here is now the problem. If you stay awake during the day like all us adults, and you're building up all this sleep pressure and ready to get a full night's sleep, and then you fall asleep on the couch or you go to the movies and you fall asleep, now you've released that sleep pressure or some of that sleep pressure. Even just a couple of minutes can relieve that sleep pressure. So no wonder then you find it difficult to fall asleep at night or stay asleep throughout the night. So be really mindful of unplanned napping. And falling asleep on the couch is napping.

The three final things I would say for elderly individuals: firstly, when you go out in the morning, get lots of bright light and try not to wear shades. Make sure you have sun protection. Get lots of light. Suppress your hormone called melatonin. It signals darkness to your body, and when you block it with light which is what happens—daylight helps put the brakes on melatonin—it makes your body realize that it's no longer darkness, and it wakes you up so that you feel good and alert in the morning. But then what we need to do is decrease our light exposure throughout the afternoon and evening. So if you go out for a walk in the afternoon now is the time to put shades on. People with televisions in their bedrooms tend to sleep worse than those who don't. People who use iPads or iPhones an hour before bedtime tend to have considerably worse sleep than those who don't.

Secondly, avoid caffeine after midday. That is critical.

The last thing for older adults is medications. Some medications that older adults take for hypertension, for example, actually prevent sleep at night.

Parniti: Often sleep is compromised by other people—sleeping with our partner—is there a biological or evolutionary benefit to sleeping or to not sleeping alone? Also, I have a difficult time adjusting to Daylight Savings Time. Do you have any tips on adjusting to the time change every six months?

Matt: So how are we supposed to sleep as a species? If you look at cultures that are untouched by electricity, many of them are actually co-sleepers. They sleep as a community or group. We shouldn't necessarily adhere to that sort of classic hominid curtain. And the reason is this. Firstly, the frequency of sleep disorders in industrialized nations is astronomical. About seventy million Americans now suffer from some sleep disorder. And there are over a hundred types of sleep disorders.

If you look at these cultures that are not affected by electricity those rates of sleep disorders are usually less than 1%. What that means is that when sleeping as a group, the group tends to sleep largely at the same time. They are driven by dusk, by the sun, and

by dawn. So everyone has a much more stable regular common sleep pattern. Now that is not true in industrialized life. First, we have higher rates of sleep disorders and people are going to bed at different times for different social and professional reasons. As a consequence, having a partner in your bed who is off your schedule and sleeping at a different time and/or has a sleep disorder—snoring, sleep apnea, tossing and turning with insomnia—has a profound impact on your sleep, too. And we now know that between some 40% and 60% of couples will either not sleep in the same room or they will start sleeping in the same room but then end up sleeping in different locations, either on the couch or in a guest room. So now there is a revolution, largely unspoken of because of the stigma, which is called the wonderful sleep divorce, where people are deciding to go to sleep in different rooms where they sleep better. And the stigma around this of course is that it signals that you're not having a healthy relationship if you are not sleeping in the same bed then perhaps you are not having a physical relationship. In fact the opposite is true if you look at the data. People who get more sleep are more physically engaged in their relationships than people who are not getting sufficient sleep in part because it regulates many of our hormones and our energies that are critical to that side of nurturing physical relationship. So that's a big topic, and I think we'll see a continued recognition and acceptance of it in the community.

Coming onto Daylight Savings Time, it is a problem. It is very hard on the body when it shifts between time zones. It cannot make up time zones as quickly as we can now travel with on a jet airplane. It causes a mismatch between the biological clock and the new clock time in the time zone. That mismatch causes what we call jet lag. Every day that you are in a new time zone your biological clock; your circadian rhythm, adjusts by about 1 hour of time. So if I fly back to the United Kingdom, which is 8 hours ahead of us, it is going to take me 8 days to catch up an hour each day. Now for Daylight Savings Time: what that means is it's going to take a little bit of time to catch up. The best way to try and deal with Daylight Savings Time is to use an alarm to gradually titrate. It is almost like coming off a drug. You're at full dose and you come down to 80% dose and then you come down to 60% dose. If you were in the springtime where you are losing an hour sleep, and we'll have to wake up an hour early, in the weeks before, try to start waking up 10 minutes earlier then 10 minutes earlier the next day and 10 minutes earlier the following day.

Aryae: You talk about the global sleepless epidemic as the greatest public health challenge that we are now facing, and hearing what you are now saying, it makes a lot of sense. Before the call, I was curious and Googled public health challenges and I got all kinds of lists. Here is one from the Centers for Disease Control and Prevention (CDC) that was published in March 2017. They have on the list alcohol-related harms, food safety, healthcare-associated infections, heart disease/strokes, HIV, motor vehicle injuries, nutrition, physical activity and obesity, prescription drug overdose, teen pregnancy, and tobacco use. They do not have sleep on their list. So what do you say about that discrepancy?

Matt: What is fascinating is that almost every one of those large public health concerns is directly related to insufficient sleep. So, for example, we know that insufficient sleep is tied to high rates of cardiovascular disease, the calcification of the coronary arteries, hypertension, and stroke. We also know that sleep loss is causally related to obesity. Sleeplessness has a profound impact on your immune health and in fact you can go to so many of the classic immune disorders even the common cold. People who get six hours of sleep or less are between 50% or 60% more likely to catch a cold than those who sleep more.

Cancer is now strongly related to insufficient sleep. That includes cancer of the bowel, cancer of the prostate, and cancer of the breast. So much so that in fact the World Health Organization (WHO) recently classified any form of nighttime shift work as a probable carcinogen. Set jobs that disrupt your sleep wake rhythm are cancer-inducing, that is how strong the evidence is right now.

We now know that drowsy driving causes more accidents on our roads than either drugs or alcohol combined. And yet we spend a fraction of 1% of our public health policy budget on educating people about the dangers of insufficient sleep.

Risk-and-reward behaviors are intimately tied to insufficient sleep, from risky behavior to drug addiction and drug-taking and teenage pregnancy. We've done a lot of work in this area, too, particularly on adolescent youth. You shorten their sleep; they become much more risk-taking and sensation-seeking. They engage in behaviors that are high-risk behaviors.

Every one of the conditions on that list has a link to insufficient sleep! So why sleep is not on that list is so desperately sad and striking to me. That is why people like me needed to become much better sleep ambassadors. We need to go to places like Capitol Hill. We need not just go there waving our hands saying look at this problem. We need to come up with 21st century new visions of solutions. And that is one of the things that I speak about in the forthcoming book. And is one of the things that I am trying to now push very hard with a number of quick advocacy policies. We need to change society for the better. We need to reorient and prioritize!

Aryae: How is the way any of us might be getting a night's sleep affected by where we live, by our cultural background, by a socioeconomic status?

Matt: I've spoken a lot about how and why we sleep from a biological angle or from the physiology of our brains and our body. Of course they are strong determinants. Our biology is a big determinant of how we sleep. But sleep is also determined socially. It is a social construct. Just think about it. Like who are you? What is your social standing? And do you think that makes a difference with how you sleep?

For example, take someone who is of a low socioeconomic status. What is their sleeping condition like? Do you think that social status changes their opportunity to get good night's sleep? And the answer is of course is yes. There are different factors that play out pressure on sleep in low socio-economic classes. There's a deep sleep disparity right now. But it is not just biologically caused. It is socially caused. Firstly, one of the principal reasons is your sleeping situation. If you live in a neighborhood where there is high crime, for example, then that psychological threat of danger will prevent you from getting a full and normal night of sleep. And this we know from lots of good studies—that psychological weight of danger if you're in the neighborhood where there is constant violence or there is constant threat of burglary or home intrusion, imagine how well you would sleep at night. Not particularly well, I'm sure.

The other thing is how work pressures sleep and grabs sleep like a vice grip and squeezes it from top to tail. What I mean by that is a lot of low-paying, low socio-economic employment is in the service industry right now. Service industry jobs tend to start very early in the morning. And as a consequence, people from low socioeconomic families also often don't have a car, so they are taking public transport which can sometimes start at 5 or 6 in the morning, they may have to wake up at 4 o'clock in the morning to get to those jobs. And then when they come home sometimes they may have two

jobs--one that goes from the afternoon into the evening. Often these are families that have just one parent. You have this huge burden of child care in the evening and then you are waking up at 4 o'clock the next morning to get to your job again. So there is an economic and employment disparity that forces poor sleep in these communities.

Amit: We have a lot of interest from people around the world. Isabel from Germany says, "I'm one of those people that are sleeping less and less and can that be reversed? I've done this for years. Is there any benefits to changing now rather than in my late sixties?"

Matt: There is always benefit. And one should always hold out hope to try and obtain the very best sleep that your brain in that time of life is capable of. As I said some of these sleep hygiene principles--you can just Google sleep hygiene--should really help your biology at this stage of life, which is about finding the best chance of producing the best quantity and quality of sleep that you can have. So I think there is usually always room for improvement.

Kozo (a caller): Hi Matt. Thank you for this wonderful information. I was really struck by when you said that sleep and bad sleep patterns can actually cause disease. I'm wondering if you know if there's any research being done on sleep being a therapeutic for disease. So let's say you are diagnosed with cancer, is there any research being done where they require people to sleep in a certain way for a certain amount of time and then check and see if that affects the disease? Also, is there any movement or any research being done on sleep and hospitals, because it seems to me like you said sedation is not sleep? And in a hospital environment it seems like sleep is almost impossible. They come in and check on you. You have a roommate. They are moving things around. They have lights on. I'm just wondering if that is causing more disease or causing more mortality?

Matt: So the answer to both of those questions is an emerging area but the movement isn't really in full swing right now. The evidence is concrete. We have good evidence and clinical studies in animal models that suggest that if you bi-directionally perturb sleep you can accelerate or retard certain diseases. A good example of this is cancer. If you are fighting a battle against cancer and not getting sufficient sleep, we now know that the cancer will grow more aggressively and more quickly. So people are now trying to think about prioritizing sleep as an agent that will aid in the fight against cancer. Some really powerful and quite disturbing animal studies are out there showing that if you are short changing animals who have cancer of sleep, that cancer can increase in its speed and size and growth by 200%. So the evidence is that sleep is causal and bi-directional. It has forced people like me to try and advocate to medicine and doctors that we need to start prescribing sleep. Not prescribing sleep medication but prescribing sleep as the elixir of life, as a panacea for good health, and perhaps one of the best Archimedes levers that we can think of for actually brute forcing health under the attack of disease. And we will see more of that in the future.

In terms of sleep in the hospitals, you are absolutely right. There's now a slow but growing recognition that it is a major problem. The place where I would argue you need a good night's sleep the most is perhaps the last place that you get it, which is a hospital. And one of the things that I write about in the forthcoming book, is why don't we do what we do on transatlantic flights. We give people a free eye mask and a free pair of earplugs. Add a small cost and it would help significantly with improving sleep. Now we've even seen evidence in neonates in the Intensive Care Unit that if you regularize the sleep they will exit out of the Neo Intensive Care Unit in half the time.

It's a dramatic improvement in health.

Albert from Oakland: Thank you so much. So, what I'm hearing is that a nap during the day is not really encouraged, which is contrary to a lot of older stories of certain cultures that may have benefited from the tradition of a siesta. Or if you take a look at children for example napping is encouraged for them for brain development. So is there a shift that happens at a certain age where it is no longer required or needed?

Matt: Let me be very, very clear about naps and their use. Firstly, children should be napping. Children very early in life are what we call Polyphasic sleepers, which means they have many phases of sleep. Then they become biphasic, which means they have an afternoon nap and then they sleep at night. If you do look at cultures that are touched by electricity, many of them are biphasic. They will sleep six and a half or seven hours of sleep at night and then they will have a siesta-like phase in the afternoon. We may be in modern-day societies not sleeping in the way we are naturally programmed. And I think there's good evidence for that. But here's the problem. Most people are not able to regularly nap. And it is in that context that sleep medicine now advocates against napping.

So if you can regularly nap during the day, day after day in a very stable manner and you can do so early in the afternoon, then napping is advantageous only under the condition that you are not having problems falling asleep at night. But if you cannot nap regularly then it is not advisable. Secondly, it is not advised that you nap later in the day. And finally, for older adults, if you are napping and having problems with sleep at night it is strongly advocated against that you don't nap during the day and that you try to just push all of that sleep pressure into getting a good night's sleep throughout the night.

So children—great to be napping. It is natural. Human beings, innately, we may be biphasic. We may be born natural nappers throughout our adult life. It is just that in modern day society very few people can nap regularly and if you can't then it can be problematic especially late in the day.

Amit: Do natural supplements support sleep like calcium and magnesium or melatonin?

Matt: Sadly the evidence isn't particularly strong in clinical trials. If you are in a severely nutrition deficient state then that can have an effect on your sleep and I want to be clear about that, but many of the homeopathic medications and even melatonin—and this is melatonin in the context of once you're in a new time zone and you're stable and you're not suffering from jet lag—homeopathic medicines and melatonin for the most part have not held up under clinical trials to be any more efficacious than a placebo. If you are taking melatonin or some kind of a homeopathic medication and you feel as though it helps you sleep, my recommendation is keep taking it. The reason is that the placebo effect is the most reliable effect in all of pharmacology. What that tells us is that there is such a thing as mind over matter, and science is now grappling with this. It is acknowledging the placebo effect and we should take advantage of it.

Caller: Hello my name is Suzanne. Our new president (President Trump) concerns me in that he stays awake tweeting all night Is he going to be able to judge adequately not sleeping?

Matt: Great question. And it strikes at the very heart of one of the biggest problems with sleep. The answer is no he's not going to be able to judge based on the scientific

evidence. The fact is this your subjective sense of how well you are doing when you haven't been sleeping enough is a miserable predictor of objectively how poorly you are doing with insufficient sleep. What I mean by that is you don't really know that you're sleep deprived when you're sleep deprived. The analogy is a drunk driver at a bar who has had five or six shots of vodka and a couple of beers and who may pick up their keys at the end of the night and say, "I am fine to drive home." And your response is, "No, no, no, I know you think you're fine to drive, but trust me you are, objectively speaking, certainly not." It's the same with sleep deprivation, and we've got great data demonstrating this. That's the reason why people will say to you, "No I'm actually one of those people who can survive on 6 hours of sleep or less." That is sadly not true based on the scientific data of about 17000 studies; the number of people who can survive on 6 hours of sleep or less without measurable impairment rounded to a whole number and expressed as a percent is zero.

Mish (a caller from New York): I am now questioning the benefit of my sleep pattern after listening. I'm a senior, I fall asleep as soon as my head hits the pillow and I sleep straight through for about 4 hours. I wake up between one and three times for a few minutes, go back to sleep right away each time, and then wake up as soon as my feet hit the floor. Is there any quality to the sleep pattern?

Matt: You're worried about the waking up throughout the night— is that your concern?

Mish: Yes.

Matt: As long as you are finding that you're able to fall asleep quickly after those awakenings without a problem, and secondly during the day if you are feeling restored by your sleep and you're not feeling as though you're nodding off, or you're lacking in energy, then the chances are that the sleep you're getting is sufficient. But if it's not, or you're concerned and don't think your sleep is sufficient, definitely do go and see your doctors and let them know about those sleep problems. But from the sounds of it, it doesn't seem like you're suffering one of the two forms of insomnia. One of them is called sleep onset insomnia which is having trouble falling asleep and the other is sleep maintenance insomnia which is trouble staying asleep where you wake up throughout the night and find it difficult to fall back asleep. It sounds like you do wake up, but you're able to get back to sleep.

Amit: I'm going to go to one of our online questions: "Do you have any recommendations for getting smartphone apps for monitoring the quality of our sleep? Have you heard of things like motion eggs and are there techniques for getting dream sleep and non-dream sleep?"

Matt: It's a little bit of a mixed bag out there in terms of these sleep assessment tools, and I should also mention that I work with a start-up company up in San Francisco as the Scientific Advisor. But I think right now the apps that track your sleep are perhaps not particularly accurate. I think we'll get there very soon, and in the next 2 to 3 years, we will have good sleep-tracking devices, and I'm excited about that because right now technology is one of the biggest enemies in the bedroom for sleep. But I think it's going to be technology that is our salvation. And the reason is this, there's a common adage in medicine which is, "What gets measured gets managed." And for so many of us for so many decades we've never really had a handle on how we are sleeping because we couldn't measure it apart from our subjective sense of what time we turn the lights off and what time we woke up--and that's not a very

accurate rendering of our sleep. I'm very hopeful that soon we will have wearable technology or technology in the bedroom that accurately tracks our sleep. And once we take control of our sleep we will be able to better manage our sleep, and I think that's fast going to happen and it will only be good for society.

Pranidhi (a caller) What do you think of advocacy for institutional change in this realm?

Matt: There is just no way to cheat the brain and body out of sleep. One way or another it will catch up to you whether it's chronic sleep deprivation across a lifetime, leading to chronic disease and ill-health, or it's the tragedy of mortality and this brings us back to road traffic accidents. When you are not sleeping, you are having micro-sleeps at the wheel. Sometimes your eyelids will partially close. Now at 65 miles per hour if you have a micro sleep that usually lasts just for 1 or 2 seconds, at 65 miles per hour that means you'll drift from one lane to the next. So at that moment for those 2 seconds there is a one ton missile traveling at 65 miles per hour and no one is in control. And that can lead to fatal consequences not just for you but for those around you on the road. There's sadly no way to short change it. It's non-negotiable; it's a life support system. It's a biological necessity, and it's Mother Nature's best effort yet to counter death.

Alissa (a caller): I work sling shift so I do have an odd schedule but I try and keep my sleep regular. And this is for all the people who can't do what you describe and go to bed an earlier time—is that still okay as far as maintaining your sleep regularly but working at odd, different times?

Matt: Right now shift work is a real problem and working at different times of day causes that normal window of sleep to slide across the 24 hour clock face. That really isn't an optimal way to be falling asleep. Right now the advocacy in shift work is, if you're on a shift, try to maintain that shift for long durations of time, and then come off and have a long period of recovery, and then go back on that stable shift. The biggest problem with shift work is having shift work that is inconsistent. Now technology is going to help try to limit the burden some, but people still make that sacrifice for us and we need to make it better for them and this is one of the ways that seems to be best. If you do need to do shift work, maintain that stable shift; that off normal natural rhythm shift, for a long period of time and once that shift ends give yourself a long period of recovery before you have to go into that same shift again.

Unfortunately if you give yourself eight hours of sleep during the day versus eight hours of sleep at night, the sleep you get during the day is not the same that you get at night; it is more fragmented, and it's not as deep quality of sleep. It doesn't necessarily contain the same stages of sleep. The reason is that biologically you're not designed to sleep during the day. However, other species are. We're not nocturnal species; we are a diurnal species. And so the recommendation is make sure you do give yourself 8 hours, that's critical, but do realize that it's probably not going to be as good a quality as 8 hours of sleep during the day as it would be 8 hours at night.

Just a little bit of a caveat on that: everyone has their own circadian preference, the fancy name is pronotype which means some people are owls, and some people are larks. Some people like to go to bed late and wake up late. Others like to go to bed early and wake up early. It's a natural variation and it's determined by genetics. It also changes across the lifespan, of course. If you're one of those people who like to go to bed late and wake up late then the schedule of going to bed at 2 am and waking up at 10 am, may

actually be fine. It fits perfectly with your biological rhythm. But if you're someone who is a lark then you would like to go to bed at 10 o'clock and wake up at 6:00, then going to bed at 2:00 am and waking at 10 is not going to be optimal for your biology.

Amit: This is a very hot topic. We really appreciate you coming to share with us today. As a community how can we support your work?

Matt: I think I would just ask people to propagate the good work. And rather than necessarily support my work try and learn more about sleep and advocate more the critical thing for us to do as a society is to get rid of the stigma of sufficient sleep. This is one of the major problems right now that we face in the civilized world is that we have associated getting sufficient sleep with this thing called laziness. That we think people who get 8 hours are slothful, and they're not productive and the opposite is true. So as a society we need to be proud of our sleep; we need to reclaim our right to a full night of sleep without embarrassment and without that terrible stigma of laziness. And in doing so, we may all feel what it's like to be truly awake during the day. So please don't chastise others for getting sufficient sleep. As parents we shouldn't chastise our children because that parent-child transmission of sleep neglect is powerful and it is problematic. That's the only support I would ask for.

Join an Awakin Call this Saturday with dedicated yoga-teacher and innovative gift ecology practitioner Pranidhi Varshney. More details and RSVP info here,