CASAT Podcast Network

Welcome to season five of CASAT Conversations.

A holistic look at mental health.

Join us for a series of thought provoking conversations that delve into the vast dimensions of mental well being.

From the intricate link between physical, emotional and spiritual aspects of well being to the latest scientific research practises and therapies, we navigate the multifaceted landscape of mental health Together.

We hope you enjoy today's conversation.

I am delighted to welcome Dr. Russel Foster, today head of Nuffield Laboratory of Ophthalmology and the director of the Sleep and Circadian Neuroscience Institute.

Welcome, Dr. Foster.

It's so nice to have you here today.

I'm delighted to join you, Heather, and I should say, Welcome, Russell.

Uh, as we get started, please tell us a little bit about yourself and why you do the work that you do.

Oh, that's such a deep question.

Um, a little bit about myself.

OK, well, I guess I'm a very ordinary person who's just found the thing I love, um and so I just have enormous pleasure in doing the science that I do and asking the questions that I can ask, and it's sort of something that I think has been with me all my life.

I I at the age early age of I think it was, I don't know, nine or 10 or something.

I put a fly in a test tube and, you know, put cotton wool in the end of the test tube and put it on the of course in those days, it was turntables.

Uh, you won't know what that is, but it was sort of a thing you put records on, it whizzed round.

And I wanted to know if this fly had, um, you know, would get dizzy.

And anyway, did the experiment let the fly out of the glass tube and it flew off perfectly normally.

And so that was so cool.

I mean, it didn't have the same mechanisms that make us dizzy when we get spun around.

And I suppose it's always been asking those questions of, of, of, of How does it work?

Um, and then why does it work?

So, uh, I then drifted into, um, the regulation of light, uh, on our biological systems, and that took me into biological clocks and sleep.

So that's kind of the journey, but really just just found my niche.

And I think what's so sad actually about education these days is that we're not given the opportunity to find what we're good at.

I should add that as a young kid I was in remedial classes.

I mean, I just was often in my own world do my own thing.

It was only later that I kind of woke up and thought, Oh, this is cool and then put some energy into it.

I love that.

So curious from the beginning and really curious about our world and making sense about it.

It sounds like yes, and And also, you know, I remember I was given at an early age again, probably about the same time, eight or something, a microscope.

And we all were given these, you know, I think childhood microscopes and we remember them.

And I remember getting, you know, looking at a fly's wing or a bee sting or something like that a bit, but But they were tiny little things, and I remember my eyelashes used to get in the way of of the objective piece.

So I, you know, cut the my eyelashes off on on on one eye, and you know solve the problem.

But I remember at dinner that evening, my mother said to me, What have you done?

And I said, Well, you know, my eyelashes are getting in the way and and she said, Well, you know, they they serve a purpose.

You know, you shouldn't really do that.

And I sort of said, I think something.

Well, I only did it in one eye.

Um and she sort of looked heavenward for help.

But yes, I just I've just kind of been a bit geeky and weird, I suppose.

I love that.

I love that.

So since your work began really studying light and our circadian rhythm, I'd love for you to explain to us really the impact of light on our sleep just as we get started.

Well, there's two really important, uh, impacts of light.

The first is we have an internal biological clock that ticks away, and what it does is, is is fine.

Tune our biology.

If you think about it.

What our biology needs to do is deliver the right stuff, the right concentration to the right tissues and organs at the right time of day.

And it's the circadian system that provides this time structure for life.

But unless that master clock is regulated by the outside world so that the, uh uh, biological day and the solar day are beautifully aligned, the adaptive value of a clock of of this beautiful fine tuning is completely gone and our biology falls apart.

And the key thing is, without entrainment, without the setting of the clock to the external world, primarily by light, things would be a complete disaster.

So I got fascinated on the input side of things and how clocks regulate and how, how how light regulates clocks and therefore the sleep wake systems.

But there's a second function of light, which is sort of an acute effect of light which, uh, uh uh uh W.

When we're exposed to bright light, we're more alert.

So, uh, there's multi?

Well, in fact, there's multiple effects.

We're we're beginning to understand that, uh, there are centres within the brain which receive light input.

Um, that regulate our mood.

Um, so we've got alertness.

We've got our mood and perhaps other, uh, faculties as well.

And and of course, this fascination led our team to discover that there's a another light sensor within the eye.

There's the visual system, which, uh, which detects images of our world and that uses the rod and cone photoreceptors, which we're all familiar with.

But we discovered that there's a third receptor in the in the eye that detects broad changes in the light environment at dawn and dusk, for example, and that can set the biological clock to the external world.

And so much of my life has been understanding how light interacts with circadian and sleep systems.

Hm.

And I'm struck, really by the wisdom and the intricacies, right of the human body and how wise it is and the interconnected nature between us and nature.

Yeah, yeah, I think that's a really good point, II.

I you know, I think one of the great strengths of being a human being is that we're supremely arrogant.

We believe we can do anything we want at any time of the day.

And of course we're not, uh, we're we're we're connected to nature, just like every other organism.

And what we've spent the last two or 300 years is trying to convince ourselves that we aren't part of the environment and that we can act independently without consequences of the natural world and most notably, the light dark cycle.

And of course we can't.

And I think the exciting thing for me is that, uh, we're beginning to realise that we are part of the natural world and we need to respect those relationships.

Otherwise we set ourselves up for failure.

Mhm.

So I'm curious, really.

I'm thinking about shift workers and the impact because these are people who likely want to be sleeping at night, but their work doesn't allow them to.

And so what is the impact of not sleeping based on this rhythm?

Yeah, well, of course, the assumption has been and was for many years that sh shift workers adapt to the demands of working at night.

And they don't.

97% of people never adapt to the night shift work, and that's going back to light again.

So what's happening is that, uh, we're working under relatively dim light in the factory or the office at night, and then we experience bright natural light during the day, the drive home from work or the drive into work, and the clock will always defer to the brighter light signal.

as being data, uh, which, of course it is.

And so the clock does not shift.

Um, and you know, experiments have been done from lovely work from Harvard showing that they increase the amount of light in the workplace, uh, and then shielded people from natural light during the day.

And they adapted just like you adapt.

Um, as after getting over jet lag.

Uh, but of course, for all practical purposes, that isn't possible.

So what we're doing is working against this entire biology, saying you should be asleep, uh, and and so you can't expect to opt optimal performance.

And furthermore, if you keep on driving our biology outside of its normal range, it begins to fall apart.

I've likened it to, uh, an engine if you put an engine into first gear.

Uh, if you have a if you have a stick shift, that is.

And of course, then you'll know what I'm talking about.

Um, you know, that's great.

Cos you get that acceleration, you can get away.

Uh, but if you keep the engine in first gear, it destroys itself.

Uh, and that's very much like what we're trying to do by working against our biology, uh, at night during the night shift, so the consequences are increasingly clear.

You know, we've moved from anecdote 20 years ago to really beautiful studies from groups all over the world.

So if we just sort of summarise it into three domains, which is our emotional responses, so we see increased fluctuations in mood, anxiety, irritability, loss of empathy.

We fail to pick up those social signals from friends, family and whatever.

We just don't get it.

Um, increased levels of frustration.

Uh, a negative salience.

Now, this is really important because some lovely studies from Germany have shown that the tired brain is much more likely to remember negative experiences than positive ones.

So So, you know, if you're working against his biology and you're tired, you're remembering the negative stuff.

So your whole world view is is framed by what you remember in in terms of negative experiences, you're much more likely to undertake sort of risky, impulsive behaviours, which is you know, so So you think you can make that red stoplight?

No, you can't.

And And if you were not tired, you'd never dream of it.

But you know, you, you you you just lost that critical capacity of the brain.

You are much more likely to use sedatives and stints and so slide into a a sedative.

So you're so you're sort of trying to get to sleep at night.

But you're not producing natural sleep.

You're using sleeping tablets or alcohol and then to reverse that during the day and keep awake during the day.

You're using coffee at the mild, mild end of the spectrum and then perhaps even things like amphetamines at the other end of the spectrum.

Um, so So that's our sort of emotional responses.

Our cognitive responses?

Well, overall, our ability to process information is down.

Uh, our ability to multitask.

And what I mean by that is, you know, we're all making decisions.

We're bombarded with information, and what we've got to do is extract the important salient stuff.

It's much more difficult to do that if you're chronically tired, your our memory consolidation goes.

Not only that, but sleep is so important for processing information.

So if you want to come up with innovative solutions to complex idea, you know, complex problems, then a night of sleep could actually help you do that.

So You know, in a world where our ability to to solve problems has never been at a greater premium, we're actually depriving ourselves of that incredible capacity.

I've I've caught sleep, the greatest cognitive enhancer that we have available to us.

Um, communication skills fall apart.

Decision, creativity, productivity and and all of that sort of stuff gets lost.

But then, if we experience long term sleep disruption, as you see in many long term night shift workers who have been doing the job for 5, 10 and sometimes 30 years, then we see some really big issues developing, first of all, chronic daytime sleepiness.

So, um, you just you just never catch up.

And so you're you're running on empty even, you know, when you are awake.

And, of course, uh, daytime sleepiness can give rise to micro sleeps, which means falling asleep at the wheel, for example.

And there's a study actually, fairly recently on junior doctors from the UK showing that that 57% had either had a crash or a near miss 57% on the drive home after the night shift.

Oh, it's huge, I think, in the United States, um, there's been estimates that between 400,000 crashes on the freeway are associated with people falling asleep at the wheel.

Um, you've got altered cardiovascular issues, so blood pressure issues fall apart, possibly as a result of altered stress responses.

How do we overcome this overwhelming need to sleep well, we activate the stress axis, and of course, that can lead to higher blood pressure.

We're throwing glucose into the circulation to sort of W cos we're anticipating to either fight or run away.

And if we're not using it, then of course those levels build up greater propensity to metabolic abnormalities.

Diabetes, too.

And in fact, there's a relationship between raised, uh, stress, reduced immunity, higher risk of cancer.

So, for example, the correlations between high rates of cancer and night shift work are now so strong that night shift work has been declared a probable carcinogen by the World Health Organisation.

I mean, this is serious stuff.

And of course, some of the biggies like depression and psychosis, there is a very clear, um, relationship that if you are at any risk of developing a depression and psychosis, then sleep disruption will push you further into that sort of spectrum.

And then very recently, uh, sleep disruption in the middle years has been associated with a greater risk of dementia in the later years, the the the mechanistic link there is very interesting, because whilst we sleep, we clear a misfolded protein called beta amyloid, and, uh so it packages up and gets rid of it.

If you don't sleep, it tends to be deposited within the brain.

And in fact, some wonderful studies from the Netherlands have shown that just one night of no sleep could increase very, very small amounts deposition of beta amyloid within the brain.

And, of course, it's the build up of beta amyloid in cells, which has been linked to dementia and Alzheimer's disease.

So I think the key point is that not getting the sleep that you need at the time that you need it is not simply, um, uh, sort of the inconvenience of feeling tired at the wrong time.

But it's associated with short term and long term health issues.

Uh, as I say, we just think we can override it and we can't thank goodness Now there's some some realisation that we need to work with our biology and within the environment.

I love that.

Yeah.

I'm thinking back to what you said about our arrogance that we think we can just, like, keep on going.

No, no, we just, You know, we just think we're detached from, from from our our our our environment, it's really quite remarkable.

But, you know, I mean, that arrogance has, of course, led us to some successes, but we've got to got to learn to tame it in the context of our sleep.

Yeah, and learn to care for for our bodies, right?

Like, listen to them.

And, of course, the impact of not having a good body, the way we interact with others and danger to the broader community.

You know, we're more at risk of crashing into people or making stupid mistakes worth bearing in mind that some of the big disasters the Exxon Valdez, Um, the the, uh, the, um, uh, the the nuclear, uh, the Chernobyl were all as a result, or there was a major contribution of tired individuals making inappropriate decisions and leading to potentially catastrophic environmental disasters.

Yeah, the ripple effects, which I hadn't considered.

Yeah.

Yeah.

So there's a social there's a social responsibility that you know, it's not just us, you know, And, you know, being jocks and and and, you know, and running off and doing stuff stuff, you know, there are implications to our stupidity.

Mhm.

How do we know if we're getting enough sleep?

Well, this is the easy bit.

And this is the kind of thing that our grandparents probably told us.

But we didn't have the wit to, uh, remember, and and it's really straightforward.

Uh, if you feel that you're not performing at your peak during the day and chances are you didn't get a good night of sleep, there are other metrics.

So if you oversleep extensively on free days and particularly when you go on holiday, you can really unpack.

What your sleep needs are, um, you're dependent upon an alarm clock or another person to get you out of bed in the morning.

Um, if you take a long time to wake up, you've got this grogginess this, this sleep inertia.

Uh, if you feel sleepy, irritable, fatigued when you are awake, if you crave a nap during the day and we can talk about naps, you in more detail later.

If you are aware that you're doing stupid, overly impulsive things going back to, you know the failure to be reflective about one's behaviours if you crave caffeinated and sugar rich drinks.

And also if your family friends, colleagues say, you know you're showing increased levels of irritability or loss of empathy or well, you're just not a nice person as you used to be, and you're doing silly and disinhibited things now, most of us don't take very kindly to those sorts of criticisms, but actually they can be immensely useful in, you know, assessing whether we're getting the sleep that we need.

So it really is important to listen to, uh, the people that we work with and and the people that we live our lives with so collectively, you know that that th those are the sorts of metrics.

If you're not getting that, then you're not getting sleep and and actually had a a really important point.

And the reason I wrote the book Lifetime was because I was so irritated that people were saying, You must do this.

You can't do this within the context of sleep.

So you know there's this this myth that you have to get eight hours of sleep?

Well, yes, eight hours is the average.

But in fact the healthy range is between six hours and 10, 10.5 hours.

And the key thing is, we have to define for ourselves what our sleep duration needs are and indeed our sleep timing.

Because, of course, you know, we we we come to the concept of chronotype whether you're a morning person, an intermediate or an evening person.

And that's, you know, that's a real phenomenon.

And we can talk about the reasons for that in a moment, Uh, a and and essentially having to find what your sleep needs are.

And your sleep timing is you then have to try and build a structure around your life that allows you to to be get the optimum sleep that you, as an individual need and not be pressurised into not getting the sleep that you need, as so many of us are, you know, this is sort of Oh, well, I get up at four o'clock in the morning and I then go to the gym and da da da da Well, yeah, sure you can do that for a few years before you essentially fall apart.

I'm curious.

Will you share with us?

Uh, how sleep changes across the lifespan.

The need.

Yeah, well, well, that's what's so interesting.

There's two really?

Well, there's, Yeah, there's three really interesting issues.

One is, um, So from about the age of 10, uh, there's a tendency to want to go to bed later and later and later, and that lateness peaks in the, um, late teens early twenties Now, interestingly, it peaks slightly earlier in women than men, and men on average tend to be later chronotype than women.

And from the sort of mid the early twenties, there's a move slowly to go.

Want to go to bed early and earlier and earlier.

So the time you get into your late fifties early sixties you're getting up and going to bed at about the time, Um, you got up and went to bed when you were when you were 10 or so.

So and and on average, somebody in their late fifties early sixties will want to go to bed about two hours earlier than somebody in their late teens and late twenties.

And that seems to be due to the changing levels of sex, steroids, oestrogen, testosterone in men oestrogen, women as that that rises sharply through puberty.

And then, uh, uh, changes.

So So our our sleep, um our our our sleep timing, our chronotype will change sleep duration, um tends to get a bit slo shorter, but not always.

Um, and it tends to get a bit more fragmented, so there's a greater chance of waking up in the middle of the night.

Um, and the reasons for that it's really interesting seem to be that as we age this circadian drive for sleep, which is very robust when we're young and in the middle years So you know, uh, W during the day, asleep at night, that tends to flatten out a bit along with a bunch of other circadian rhythms.

So sleep is not as strongly driven by the clock as we age, but it's also accompanied by other things.

So, for example, the hormones underpinning the production of urine So many, um, elderly people come up to me and say, Why do I wake up in the middle of the night?

And there's two explanations for that one is, uh uh, that there's there's this, this sort of less consolidated sleep, but also the hormones underpinning a urine production are, are, are, are, are sort of slightly damped out, so it should be lots of urine during the day.

No urine at night.

But that's that's sort of not quite as the drive isn't quite as strong.

The other thing that's worth bearing in mind is if you're spending all your time sitting in a chair all day and you've got some blood pressure issues, then, of course, um, your ankles become puffy and fluid accumulates in the lower limbs.

And studies have shown that when you lie down after a day of sitting, that blood and the plasma in the blood needs to get reintegrated into the body, and that fluid can generate a litre of urine simply by lying down.

So that's, you know, part of the reason of of you know, an additional reason why you need to get up and pee so it's so important in the elderly to keep moving around and and get that blood.

You know, not not sort of settling in in the lower, uh, lower limbs.

So, yeah, our our sleep will change uh, our chronotype will change, and it's due to changing hormonal levels, changing circadian drive by the clock and other things.

You know, our physiological systems, such as urine production, are changing as we age.

Now, I talked about waking up at night and, uh, people get terribly anxious about this.

If you look at, um, societies without electricity, then sleep is what's called, uh, bimodal or polymodal.

People will, um uh, have a sl a gentle settling down, which may be one or two hours.

They may go to sleep for a few hours, wake up, interact with others in various ways, then go back to sleep again, um, and then wake up and then maybe go to go back to sleep again.

And so sleep doesn't have to be a single consolidated block.

And the problem is, most people don't know that that is the default pattern of human sleep.

So will wake up in the early hours of the morning.

Think Oh, my God.

That's it.

I'm never gonna get back to sleep, start to get stressed.

You know, start doing emails, drinking coffee, and, uh, it's unnecessary, because if you stayed calm, keep the lights low uh, then you will fall back to sleep again and then drift off to sleep.

So, I, I have friends Who who, um uh, have little earplugs.

And they listen to, um, Radio four BBC Radio four in the early hours of the morning.

And, um, I don't think it's any reflection on the programme, but it helps them fall back to sleep.

Uh uh.

A few pages of Jane Austen have also been known to work.

Um and, uh, so it's something gentle and, uh, something that can relax you and I should say that most people don't have a sleep problem.

They have an anxiety or a stress issue.

And that's the problem.

If you're stressed, if you're anxious, then it's gonna be much more difficult to, um, get back to sleep if you wake up.

And, of course, this was the great challenge during the time of covid when actually, people had a greater opportunity to sleep, Um, but were waking up because of all the horrors that were going on around them.

And, you know, the business might be collapsing or relatives or friends might be dying of this ghastly disease, you know, and and so it became overwhelming.

And so sleep was very much affected by the anxiety and the stress that, uh uh, that was caused by that vicious condition.

Will you say more about the impact of anxiety and stress on sleep?

Yeah.

I mean, I mean, I think that, um the relationships are now very clear that, uh, you know, the stress hormones, cortisol and adrenaline are really the the agents that that that disrupt our sleep, Uh, that that fail to allow us to relax into sleep.

And if we wake as we all do, to some extent, we are negative thoughts flood in and we can't get back to sleep.

Which is why I've I've I've become a great advocate of relaxation techniques and things like mindfulness.

Now, when I first heard about mindfulness, I was extremely rude about it.

I had it in the same box as you know, crys, crystal waving and that sort of nonsense.

Um uh, but I was completely wrong.

I mean, the study is now very clear that they they can really help you.

Mindfulness can really help you relax, and and it genuinely changes your your stress state so that that can be useful.

There's also some other you know, tips that people are using again.

The data isn't absolutely robust, but certain smells like lavender can help us relax.

Um, and and And either allow us to get off to sleep or if sort of, for example, lavender or other, um, gentle scents are are in the room that can help you, uh, remain relaxed if you should wake and you fall back to sleep.

One little tip I do mention is that if you do a lot of travel, um, and you are sleeping in lots of strange rooms in hotel rooms.

YY.

You know, you are more anxious anyway, because it's a novel environment.

And what you might want to do is if if you have a distinctive smell in your bedroom, uh, at home, whether it be lavender or your your partner's perfume or or or aftershave, you might want to have a few drops of that on the pillow and then you associate Ah, yes, this is my bedroom.

This is my place of relaxation.

This is my place of sleep.

So yeah, I think there's lots of things we can do.

Uh, and and as I say the first line of of trying to get better sleep is trying to get deres and reduce anxiety.

And, of course, in the society we live in, that is I appreciate extremely difficult, but it's at least a clear, identifiable target.

I'll share it with you anecdotally, Um, when I when I wake up in the middle of the night now I've been doing this practise and I.

I am a mindfulness meditation teacher and practitioner and, um oh, no, no.

You know I love it.

I'm on.

I'm on your side now.

Yes.

No, no.

Um, and what I do is like I'll notice the thoughts, right?

Or the anxiety or whatever it's weighing on my mind.

And if I just shift my attention into my body and I can tune into the fatigue that's in my body, I just slip right back to sleep.

It's been a really interesting like so it's that shifting of the attention between the thoughts and like the ruminating and then right back into the body.

And after sleep I go so that's been interesting and fun to play with.

Well, I think that's such a useful bit of advice because so many people think you get the sleep that you get, and there's nothing you can do about it.

And, of course, stress and destress is one way to get better sleep.

And clearly, mindfulness is a useful technique for some, not all, but for for a significant majority of individuals will you share with us a little bit about sleep cycles?

I think that that's helpful for people to understand in the context of waking and what happens, you know.

So, uh, we sort of tend to think of sleep.

Uh, but actually, you can divide sleep up into a series of of different states.

So, uh, before we go to sleep, there's a state of quiet relaxation, Uh, and then we drop into deeper and deeper sleep and the brain waves.

They increase in size and they become slower.

So actually, the deepest sleep is often called slow wave sleep because these are big, slow rhythms that you can record in electrical activity from from the surface of of of of the head then, and that's called slow wave sleep.

Uh, and those states are called non rapid eye movement sleep or non rem sleep.

And essentially, it's a progressive going from small, high frequency electrical oscillations into into, uh, large amplitude, slow oscillations.

But then we bounce very rapidly, from 3 to 2 to 1 to what's called REM sleep.

And that's rapid eye movement.

Sleep where, um, you're paralysed from the neck down and you can actually see the eyes moving underneath the eyelet.

Just fascinating.

I mean, I mean, it's it's, I mean, it's just amazing to watch, You know, if if if you wake up, you might want to look at your partner and see you know, these eyes wobbling around un un under the eyelids, it's a bit disconcerting if your partner wakes up and sees you looking like that.

So you know, if if if you don't want to risk that, you could always watch your dog or or something like that.

It is just a fascinating state, Um, and so then from a period, and and we would naturally wake from REM sleep so that cycle of non REM through to REM takes between 70 90 minutes.

It changes a bit, as as we age and depending upon, you know, individuals, and then so that's 70 to 90 minutes, and then from REM sleep.

You go back down into stage.

Non rem.

123, a deep sleep.

And then you go through a series of maybe four or five cycles every night, ultimately waking naturally from REM sleep.

And, you know, I was saying to You, wake up in the night.

Well, we we tend to wake up in the night from REM Sleep.

Now what's going on during these different stages?

It's not absolutely clear, but but it is becoming.

There's greater evidence for the fact that in deep, slow wave sleep, we are probably processing information and consolidating memory.

Um, and so stuff is coming in through through the day.

We don't have the bandwidth to process it and memorise it and and and manipulate it.

So a lot of that is done, uh, during deep sleep.

So what's REM sleep doing?

Well, it looks like it's the processing of emotional rhythms of emotional experiences.

Um, And so, for example, if you deprive people selectively of REM sleep, they'll show greater an anxiety during during the day.

Um, and of course, it's REM sleep where we have our vivid, most vivid and complicated dreams.

So a very interesting study was undertaken, uh, in New York after the twin towers were destroyed by terrorist action, uh, people were asked about their dream content and it wasn't planes crashing into skyscrapers.

People were dreaming of being mugged or being overwhelmed by a tsunami.

And so it's It's the anxiety.

Dreams increased.

And so So the correlation was that, you know, people were anxious and the brain was trying to make sense of the world.

And compartmentalising these issues, uh, during REM sleep and and and so some people can get very anxious about their their dreams.

I, on balance, would say, Don't be, um, it's it's just a It's a It's a an indication that the brain is doing what it should do, which is sort of dealing with the emotional states that you're in.

So, uh, you know, whilst we sleep, an incredible amount of important stuff is going on, Uh, and and we don't fully understand what these different states of REM non REM sleep are doing.

But, um, the exciting thing and I think one of the great things in the future is that we are beginning to get a greater understanding.

Lots of neuroscientists are now moving into the field of sleep, uh, to try and, you know, understand what's going on.

How information that's been temporarily stored in one bit of the brain is then moved to another bit of the brain and how it's all being integrated and and, you know, illustrating the fact that whilst we sleep, it's not a shutdown of the brain.

In fact, some areas of the brain are more active during sleep than during wake.

And, of course, it illustrates the fact we're doing really important stuff whilst we sleep.

Yeah, absolutely.

Um, you know, I'm struck by the importance of sleep on the brain specifically, um, and I'm curious if you'll talk a little bit more about the impact of sleep and mental health.

Yeah.

So if we go back to the 18 eighties, um, a chap called Grapeland, who's called the the the the Father of psychiatry notice that, um, poor sleep was a feature of what we'd now call schizophrenia and other mental health conditions.

Um, and those studies or those observations were kind of forgotten.

And we move forward to the 19 seventies, you know, almost 100 years later, and people, uh, were given antipsychotics with the introduction of antipsychotics and the poor sleep and the disrupted circadian rhythms, Um were, uh, uh, uh, uh uh uh, uh thought to be as an artefact, a side effect of the antipsychotics, forgetting the fact that for 100 years, you know, poor sleep had been noticed in in mental illness and this rumbled on.

So it was a side effect of the antipsychotics.

And I was in an elevator with a psychiatrist and and, uh, in a in a hospital that would be remain unmentioned.

And this psychiatrist sort of had recognised me from some meeting and said, Oh, you work on sleep, don't you?

And I said, Well, you know, kind of he said, Oh, yes.

Well, um, my my patients with schizophrenia don't sleep.

That's because they don't have a job, so they get, get up, go to bed late, get up late, miss my clinic and don't have friends because they were up all night and I thought, Well, that's one of the most stupid things I've ever heard.

Um, so I got together with some colleagues, Um, notably Eileen Joyce, uh, at the Institute of Psychiatry.

Uh, and, um, we studied her patients with schizophrenia.

Um, and what was we looked at?

20 individuals with a diagnosis of schizophrenia, 20 who are unemployed and 20 age matched individuals and what blew me away.

I mean, absolutely blew me away as the sleep wake cycles of those individuals with schizophrenia were not just bad.

They were smashed, absolutely smashed, and the unemployed were basically normal.

They were not statistically different from the employed, so this was not a lack of employment.

There was something more fundamental.

And it led us to propose a model that the pathways in the brain that are associated with sleep and the pathways in the brain that are associated with mental health overlap to some degree.

And so, if there's a change in a brain neurotransmitter that predisposes you to, uh, mental health, say serotonin or one or the other neurotransmitters, it's going to have an impact upon sleep at some level, because the sleep wake cycle draws from all the brain neurotransmitters.

So so there's an intimate association mechanistically at the core between mental illness and sleep.

Um, and we've demonstrated that using using mouse models, so genes that have been linked to um, schizophrenia, for example, were changed in a mass, and the mass was then showing not only mouse like symptoms of schizophrenia, and I won't bore you with what they are.

But critically, the sleep wake patterns were also breaking down.

So we have a lot of evidence now for that core.

But of course, it's much more than just sort of a genetic and mechanistic overlap.

And this is where the important stuff comes in.

Because, of course, the poor sleep can exacerbate because of its distortion of physiology, that increased anxiety that increased sort of salience of remembering negative thoughts.

All of those sorts of things can exacerbate the levels of mental health, uh, mental illness.

And of course, the mental illness can feed back and make the sleep work.

So you can go from sort of this predisposition this sort of mechanistic overlap, but then move very rapidly to a worse state because of that positive feedback where the mental health or the mental illness makes the sleep worse and the sleep poor sleep makes the mental illness work.

So, yeah, this is a very simple model that we could then predict, So it was obvious, You know, if you can even partially consolidate sleep.

Do you improve mental health states?

And so Dan Freeman, who's a brilliant psychiatrist here in Oxford who led this study, showed that partial sleep stabilisation in people with insomnia showing paranoia and hallucinatory experiences.

So they were on the psychosis end of the spectrum.

If you partially controlled their insomnia, you could actually have a big effect at reducing their levels of paranoia and hallucinatory experiences.

So that was the first large study showing that you could actually think of sleep as a new therapeutic target mental illness.

So I think this is an exciting time.

And now psychiatry is embracing this to some degree.

Um uh, across the world, um, and thinking right.

You know, it's not simply an artefact of the antipsychotics or the drugs or the fact that they don't have a job.

We can actually do something about it by partially stabilising, um, the sleep wake cycle.

And in fact, I mean, one of the things that we're working on at the moment cos it's, you know, we can talk about the various ways that you can try and stabilise sleep now, but what you might want to do, um, for these individuals with really bad sleep is have a short, um, course of drugs that stabilise the biological clock that regulate the clock, get things back in balance.

And then, um uh, then they can, uh, uh, go off the drugs and use sort of non pharmacological agents.

Uh, so I think it's an exciting time.

Um, and, um, I'm delighted to be involved with a range of studies that are looking at Yeah, that's incredible.

I'm curious.

You said, you know, to a degree that sleep is being used as an intervention.

Um, will you say more about that?

Yeah.

So what?

This unpacking the study?

It it was, um, a digital cognitive behavioural therapy for insomnia.

So basically, it's something that people had on their phones and they were given daily advice based upon, You know their experiences.

Um, and said OK, What you might want to do is get more light in the morning, stabilise your sleep wake cycle by eating at the same time, going to bed at the same time.

You know, it was essentially what's been called.

Um uh, uh sort of, um sleep, health, sleep hygiene.

Uh, and and of course, that that can can be useful, extremely useful in many cases.

But if the sleep wake disruption is very severe, so we work with people who have no eyes.

They have, in fact, blind veterans, UK and blind veterans.

USA.

These individuals have lost their eyes or they've been profoundly damaged in combat.

And of course, if you've got no eyes, it means you can't set the body clock to the external world.

So you then drift through time.

And so it's like unremitting jet lag for the rest of your life.

And so you know, it's not a lot you can do at the moment for those individuals, and it's and it really is terrible.

And these individuals have not only lost their sense of space, they can't see the world.

But they've lost their sense of time because of the damage to the eyes.

So I mean, II, I I'm privileged to to to meet many of these individuals, and, uh, I remember chatting to one chap and he had lost his eyes.

But, you know, he was living on a on A on a road and he said, I'm not going to be the person with the untidy garden you know, I'm going to deal with this so he would work out how to get the lawnmower out of the out of the garage, where to plug it in.

And he'd worked out ways to cut the lawn even though he couldn't see it.

So, you know, he felt this.

I mean, these these individuals were remarkable.

Then, uh, his wife came down and tapped him on the shoulder and said, It's 3 a.m.

in the morning.

You're waking up the neigh neighbours.

And so you know, this man who wanted so much to be normal and do normal stuff like cut the lawn couldn't do it because he didn't know what time of day it was because his internal clock was completely out of sync with the outside world.

And and in fact, that's why we're developing drugs.

Um, we've got a drug that, uh will mimic the effects of light on the clock.

It's all been tested on mice.

We know it's safe in humans, and we're just about to start the clinical trials.

And if I can end my my career by giving back a sense of time to those extraordinary individuals, I will I will leave very happy, but it's not just the profoundly blind.

We've touched on severe mental illness, like like profound levels of schizophrenia, but neurodevelopmental conditions in Children sleep.

Wake cycle in those individuals is absolutely smashed.

And these poor kids, you know are getting dreadful sleep, the family getting getting terrible sleep and the the kids are so tired they can't then make use of their educational opportunities during the school day with education.

So it would be wonderful if we could we could we could even partially stabilise the sleep wake of of those individuals.

So that's the kind of way things are moving.

Um uh, going and And really, it's a great example of how curiosity driven research is giving rise to, uh, new targets for therapeutic, uh, development.

Mhm.

Well, it takes me back to your curiosity, right as a young child.

And, um, I'm sure that's the researcher.

I mean, that is the how you embody as a researcher, which is cool.

Well, I I'm privileged.

Of course, research is a team effort.

As everybody every scientist will say.

The days of, you know, uh uh, uh the the white coated, uh, bald headed white male plugging away in a laboratory is just a myth.

I mean, I'm privileged to work with with many bright, both young and old individuals.

And it's and that's part of the joy.

I think of science, you know, it's a collective.

It's a collective endeavour.

The tragedy is, of course, collective endeavours and not recognise.

You know, for the Nobel Prize, there's only three recipients in one area.

And that's really tough.

When you think of the incredible contribution of many scientists to our understanding of the circadian rhythm, for example, Yeah, So we we've got, I think be much more sensitive to the fact that science is very much a collective exercise.

And we need to acknowledge, you know, from both young and old, not people have just, you know, lived and survived for 40 years.

Uh, I am thinking about how I wanna ask this, but so with mental health and sleep, you know, you talked about this cycle.

Um, and I'm curious, you know.

Is it a bidirectional relationship?

Is it one starts and then the other vice versa.

Can you say more about that?

Yeah, I think I think there's this predisposition because of the wiring you know, some people are going to be more vulnerable than others.

And you know, if things are going along fine, then you're probably nudging towards, let's say, a depressive or maybe even a psychotic episode, but it's kind of under control.

But then you experience poor sleep, and the whole biology shifts to the to the more dangerous state.

Because, as I say, the poor sleep is exacerbating the level of mental illness, and the level of mental illness is, and so you can go from actually pretty fine to really bad, very rapidly.

One of the interesting things, um, is that a very good predictor of depression, uh, is a change in the pattern of sleep.

And that's also true for other mental health conditions.

And I have a fantasy that, you know, we can develop a a simple wristwatch device that can plot the rest activity cycle for those who are vulnerable in the community.

Um, this information will go to a smartphone.

The smartphone can then talk to the, uh, the clinicians, some clinical nurses, for example, and they can sort of see this change in sleep pattern with these vulnerable individuals.

Give them a call say, Do you want to come in?

Shall we talk about what's going on?

And so, um, in a very gentle way, you can try and pre empt, you know, a a slide into a dangerous state before it actually occurs.

So we can not only think about sleep as a therapeutic target, but we can also think of it potential as an early early warning system.

Mhm.

Well, and I'm thinking about someone who has, like, PTSD and experiences night terrors.

Yeah, well, that's that's very interesting.

We've done some work on post traumatic stress disorder.

Um, and we touched on the fact that when you're asleep, you consolidate memories.

Um, and we have some lab based data which I think is really interesting.

So individuals were shown just dressing films of of funerals of self harm.

I mean, you know, not horror, but not great stuff.

Um, and then one group was allowed to sleep normally after witnessing these these, uh, movies and the other group was kept up and not allowed to sleep.

And what was so fascinating is that those who were sleep deprived were far less to have those flashbacks and intrusion, intrusion memories.

So In fact, the current practise of encouraging people to sleep after PTSD may not be the best strategy.

It may actually be wise to keep them up so that you don't consolidate the memories immediately after the trauma.

Now it's still early days, but I think it's a very interesting way.

It's a very interesting relationship.

And and of course, you know, we talked about dreams and you know what's going on.

And and and and, of course, what dreams are is an abstract, surreal, almost version of the world.

Um, but what post traumatic stress disorder is is a recapitulation of those horrors that you've experienced.

So it's very it's not dreams.

It's something very different from dreams, and that's why they can be so extraordinarily distressing.

And of course, it's the sort of thing that also some of the veterans that I work with, um, experience so.

But we are rather interested, I think in in, in going, doing more research on what you do after a traumatic event.

I.

I was chatting to, as you do, um, somebody at dinner.

Um, and I won't explain where um and they were Irish and I was asking about wakes where the family and friends all gather before the the individual is dead, to pay their respects and and to sort of be a community around this dying person.

And what happens is that this community drinks a hell of a lot, um, and doesn't get much sleep.

And both drinking a lot and not getting much sleep will impair memory formation.

And I wonder.

And of course, this is just and waving speculation that I wonder if these traditions have built up because it's a way of reducing the trauma and the flashbacks that you might get as a result of los losing a loved one.

Now I'm not advocating, you know, getting drunk and boozing excessively.

But do you know it's an interesting correlation and the extent to which some of our, um practises So you know, after battles, you know, traditionally, warriors would, you know, drink excessively and and this is all stuff that would would fail, would would impede memory formation, and they stay up all night.

So I think there might be some interesting cultural stuff there.

We need a sociologist to look at what people do after combat, and I'm I'm really curious and I hope that researchers like yourself will look at this.

Um, what is that best practise for sleep after experiencing a traumatic event?

Well, I think on the emerging data, and I have to stress it's the emerging data.

I think it might be smart not to recommend sleep, anything that consolidates memory.

So what we found, at least in the lab based studies, is that if you keep people up, you get fewer intrusion or memories and flashbacks.

Now, we've got to do more research, but I think that's a really fascinating, and it sort of kind of fits with the biology.

Sleep is associated with memory consolidation.

And what do you see with post traumatic stress disorder?

You see, a vivid recall, a vivid memory of these appalling events and in the emerging data Is there a length of time?

Yeah.

What?

What?

Well, it it was Yes.

So there are, uh, fewer intrusion memories in the people that didn't sleep, and they drop away very quickly compared to the other individuals who are showing intrusion memories that can go on for weeks.

Yeah, it's very interesting.

Yeah, I think I think it obviously needs more work, but I think it's It's an area which is really worth a worthy of further investigation.

Well, and is it Is it the length of time?

Like I'm curious.

How long do you have to stay awake to not have those intrusion memories?

Well, that's of course, we don't know.

We've got all night.

Yeah, and and and so it was a bit of a hammer to crack a nut.

I mean, it may, you may not need a whole night of no sleep or indeed, two or three nights of no sleep.

Um, we don't know.

And those are the sorts of really interesting questions that need to be unpacked.

One thing we might touch upon is, um we talked about night shift workers and we talked about some of the Garcias that that couldn't happen.

What I think is important, though, is that the 24 7 society is not gonna go away.

It's it's naive to say you can't do shift work, and so I think we need to engage with employers in this whole area.

And many employers are frightened of this and and just don't want to engage, but they have a duty of care and so there's a lot that can be done, I think, from the working environment to mitigate some of the effects of night shift work.

So if you have loss of vigilance as we touched on earlier, you know, on the drive home again, why isn't the employer encouraging the use of apps, uh, on the dashboard to stop you falling asleep?

Um, if you have, you know, BMW or something.

I think they they I Not that I would know personally, uh, but they have those extraordinary devices already built in.

If you have a loss of vigilance in the workplace and you're operating dangerous, potentially dangerous equipment, then you actually make sure there's enough light to increase alertness to actually reduce some of the effects of tiredness.

I think poor physical and mental health, which is so common in night shift workers.

Why don't we have higher fre frequency health checks to detect these problems before they become chronic?

So the drift into diabetes two and obesity We should catch these and maybe use medications S sort of to try and get these conditions under control before they become chronic.

OBE, obesity, diabetes, two metabolic abnormalities.

So what kind of food.

Do we give our night shift workers?

It's about as bad as you could possibly get.

It's high fat.

It's high sugar.

The vending machines are full of chocolate bars.

I think what encouraging people to take protein rich, easy to digest snacks is is you know, not gonna be trivial.

But at least that should be, uh, AAA, an available option for night shift workers.

And of course, it isn't, um, failure to appreciate the consequences of night shift work not only by the individual but also the friends and family that they share their lives with.

And so I think educational materials directed at both the Let's say, the the individual, but also the person they are their partners.

I mean in some night shift work in the United States.

The divorce rate is some six times higher than the same job during the day.

Shift partners need to know that this isn't the person that's turning into a monster.

In some sense, they are.

But this is an inevitable consequence of driving their body outside of its normal biological range, and they need to know that it's in a sense, not really their fault.

Um, I think the variability to cope with night shift work could be related to your chronotype, which we talked about earlier.

You know, mornings and evenings.

Well, well, if you can easily chronotype individuals, they are simple questionnaires.

So wouldn't it be smart to get the morning people to do the morning shifts and the late people to do the late shifts?

I mean, what you must avoid at all costs are late types doing morning shifts.

So the greater the the the disparity between your biological day and when you're expected to work, the more difficult it's going to be and the greater your chances of, of, of, of exacerbating health conditions.

And then I guess finally, these pathologies develop over time.

So maybe we should think about and we don't have the data to support this, But this is this is a thought.

Maybe you should limit night shift work to, let's say, four or five years, you cycle off and then you can cycle back on again.

Um, and I suppose the other thing that is so important is that many people don't want to work night shift.

This is an economic, um, driver.

And so we need to think about how we compensate people moving from night shift, work to day shift for their health.

I mean, the burden that they will have on the state in terms of the medications that they will need and beyond is is probably outweighed.

Um, by the by the by the by increasing their wages somewhat, um, to shift to the day shift.

I mean, I think we've got to be more intelligent and less brutal about this whole whole subject area and I, I suppose.

Yeah.

I mean, and the other thing I should just just mention I mean, we we we touched on poverty.

It's the it's lower socio-economic groups that are in this trap of of getting chronically deprived sleep and and just parenthetically, I mention a study we did on early teenagers.

And we one of the questions we were just interested to see what the sleep weight patterns of these of these British early youth were.

And one of the questions was, Do you share your sleeping space?

You know, your bedroom with anybody else?

Um, what we didn't ask was Do you have a bed?

Um, and of course, what we discovered is that many of these kids are trying to sleep on the family sofa while the family are watching the TV.

They're getting terrible sleep at night.

They're struggling through the school day.

They're being marginalised from their educational opportunities and they're therefore caught in this poverty trap Sleep being a critical issue here.

So we've got to think about I think sleep and socio-economic groups and think creatively about what we can do.

II, I was told a story, actually earlier today by somebody who, um developed, uh, a a nursery, uh, for poor Children or poor socio-economic kids between the wars and they installed.

They were aware that these these kids were not getting the sleep they needed.

So they installed, you know, little cots in in a room where the kids, uh uh, could sleep, and 11 young lad came in and said, You call that a bed?

You're not going to fit many people in that, um, because he was used to actually sharing a bed with multiple other people.

Um, and I and I just think that this is something that we've kind of ignored, and it's something that we could think about and do something constructively.

Mhm.

Oh, those are all such helpful ideas.

Um, on how to support sleep for the betterment of all Going back to the ripple effect and the societal impact that you talked about in the beginning As we wrap up here, Is there anything else that you feel is important for our listeners to know or understand?

I think that, um, we've covered a lot of the ground.

Um, we haven't gone into huge amounts of detail about what you can do during the day, what you can do before bed, the bedroom and in bed.

So, um and that's that's a that's a long dialogue and which we don't have time for.

Um, but But I urge you to to look at Lifetime, which which actually unpack some of this stuff and give some simple recommendations about how we can improve our sleep.

We we so many of us feel that we don't have any control at all.

We do.

Um, it's it's there's lots of stuff we can do.

It's a highly dynamic, very flexible behaviour that we can have control over, and we should stop being frightened about our sleep, embrace it and stop worrying about it.

Thank you so much.

I love that.

And the other piece we didn't talk about are naps, which is one of my favourite things.

So we'll have to talk about that another time as well.

Ok, all right.

Well, it's been so nice talking to you, Heather.

And, um, yes, we must get together again.

I would love that.

It's been lovely to have you.

Thank you, Russell.

Great pleasure.

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