

1. I was always taught it takes 21 days to change behavior. So, sleep is only 14?

Great question, glad I have a point to clarify. So, what I was referring to was that the biological/physiological mechanisms that need to change for you to have the highest quality, most restful sleep. So getting your circadian rhythm in sync, having a substantial melatonin release at a time that you are ready for bed, a cortisol spike as you wake up (which is a good thing) to help you feel refreshed, and generally just optimizing the underlying mechanisms to get you the deepest, most restorative sleep. A lot of these things start to happen much quicker than 2 weeks, but we tend to say 2 weeks because (a) we know life gets in the way of the best of intentions and can set things back and (b) it'll probably take 2 weeks for people to notice the improvements in their sleep and reduced daytime fatigue, it's pretty gradual, not like a light switch. The actual BEHAVIOR of getting people to go to bed at the right time and wake up at the same time every day is a completely different animal, and that goes more into motivation and the behavior change literature. It all depends on how highly motivated the person is to address their sleep issues, and I've worked with people that just never got there because it just wasn't that high of a priority for them.

2. How many hours of sleep per day should an adult aim for?

The AVERAGE adult needs just about 8 hours of sleep to perform optimally, but sleep amounts are normally distributed in the population. So, there are some people in this world that only need 4 hours of sleep, and there are some people that need 12 hours. Life tends to be a lot easier for the 4 hour people because of our societies standards for "productivity", but if a person needs more than 8 hours it doesn't necessarily mean they are lazy or depressed, it could just be biological (although still keep an eye out for other factors). You can actually find out your "sleep number" by going to bed at the same time every night for about 2 weeks (see above) with no clock and no external cues of time (including light, so black out the windows) and eventually, after you've paid off your accrued sleep debt, you'll start waking up at approximately the same time every day. However, many hours that is, that is your current optimal number to get every night, but be warned, it does change throughout your life!

SIDENOTE: Teenagers need more sleep than 8 hours! They probably need closer to 9-10 on average, and frequently get a bad rap for being lazy, but they are probably just constantly sleep deprived because our schools and society in general is not set up to let them get the sleep they need

3. Do you have any thoughts on the use of prescription medications (e.g. Trazadone) and supplements like Melatonin for sleep?

As far as prescription meds go, great question with a lot of considerations. I think I'm a bit more forgiving than a lot of my fellow sleep researchers given that I am clinical and have seen the acute need for them. So sometimes they really are necessary, but in most cases I would recommend trying as many behavioral fixes to sleep issues as possible before going to prescription medications if that's possible. Prescription meds tend to "alter" our sleep-in ways we don't fully understand yet, and similar to alcohol they may be "sedating" us more than helping us get high quality, restorative sleep. Some sleep alterations have been shown to benefit some clinical cohorts though (like schizophrenia) so they are not all bad. I think the biggest problem is they really aren't getting at the root of the problem and people can become reliant on them and need to increase dosages to have the same effect. It's similar to using a benzo before exposure therapy, you just aren't getting the full benefit of the experience. With the caveat that I am not a prescriber so feel free to take this with a grain of salt, I would prefer to see them used on an as needed, acute basis rather than a nightly prescription, and instead try to incorporate behavioral remedies along with them. For melatonin see below!

4. Is it harmful to take 5mg melatonin every single night?

Nah, you should be fine :) I would generally prefer seeing melatonin use before prescription drugs discussed above. It really is just a natural hormone, so any excess should just get washed out. The only potential issue I know of is that if you are supplementing your natural release every night, you may train your pineal gland to not release

as much on its own, so if you miss a dose it could lead to a rockier night of sleep, but I don't know of any research that suggests that this would be long-term or that doesn't reset if you stop taking it for a while. A couple of notes about it though, similar to caffeine there are individual differences in how much melatonin affects you. So, for some people it can really knock them out and for others it may have almost no effect. If 5mg doesn't have much of an effect, it's unlikely 15mg would, so I'd recommend saving your money and looking for other means of restoring your sleep. If 5 mg knocks you out, you can absolutely play around with dosage to find what works best for you. And this leads to the final point, I don't necessarily agree with the typical way people take melatonin, which tends to be one big dose right before they crawl into bed. It does take time for the melatonin to circulate, reach the brain and have the effect you want, so if you are popping it right at midnight, it likely won't be having its maximum impact for another 1-3 hours, and depending on your sleep schedule may not wear off completely and could get in the way of your morning. One thing I'd recommend experimenting with is taking a much smaller dose significantly earlier in the night (7-10pm depending on bedtime) as a melatonin "primer" to help trigger the onset of natural melatonin release. Something to think about and play around with if you have the time and no important late-night plans just in case it does tire you out earlier.

5. Have you considered the upper and lower brain function framework and its association with sleep deprivation?

There is some research starting to look at this! Some very new stuff suggests that the after-sleep loss, the amygdala loses connectivity with the frontal regions of the brain and increases connectivity with the lower, more primitive regions of the brain. This is all very new though so I can't say much about it yet, but certainly something I hope to be looking at with my future research!

6. What should a person do if they have continued nights in a row of disrupted sleep every night?

First thing is not to panic. Humans are highly adaptable, and while it sucks, you will get through it (although it helps to be extra cognizant of your emotional reactions). Then I would start going through that general list of ideas for improving sleep (maintain a good schedule, get light in morning, cut down caffeine, etc.), and through it all the best thing to do is to try to have an attitude of experimentation rather than needing a quick fix, which can be easier said than done given that we may be more sensitive to frustration (that negative loop rears its head again). In most cases, if you make a few changes and really just prioritize sleep for a good while, things tend to get better. A diagnosis of insomnia is having at least 3 nights of bad sleep every week for at least 3 months, so if it starts to get that frequent and that chronic, then it's time to reach out for professional help, and I would recommend starting with CBT-I (again SBSM society and UPenn have directories of trained providers to help you find one in your area, great place to start)

7. Is there such a thing as catching up on sleep?

Yes, that is a thing! So, if you miss out on sleep consistently, you accrue something called "sleep debt" and you at some point are going to have to pay it off. College kids are great examples, sleeping 4 hours a night during the week and 12 hours on the weekend. Some sleep researchers think it's a one to one ratio in that for every hour you miss, you will have to pay it off eventually. I am not so sure about that, I think on the positive side you might be able to get "deeper" than average sleep to catch up faster, and on the negative side you have such chronic sleep loss it can start having ill effects when your "debt ledger" gets full (sorry new parents). What's even crazier is that there is some new evidence that you can "bank" sleep! So, if you know that there is going to be a situation in which your sleep will be limited, you can actually try to sleep extra beforehand and it has been shown that the subsequent sleep loss won't impact performance quite as much!

Here is the link I referred to from my previous advisor discussing our prevailing theory of the increase in COVID dreaming: <https://wsbt.com/news/local/what-do-your-bizarre-pandemic-dreams-mean-notre-dame-researcher-weighs-in>

Here is the battery of surveys I give when assessing for a sleep disorder. Typically, I'm trying to "rule out" things to see if the sleep issues they are having are related to insomnia alone or if they are being caused by another disorder, such as sleep apnea:

- Insomnia Severity Index and Dysfunctional Beliefs and Attitudes About Sleep - Insomnia Symptoms
- RLS Rating Scale - Restless Leg Syndrome
- STOP - Sleep Apnea
- PCL-5 - PTSD
- PHQ9 - Depression
- GAD7 - Anxiety
- Smith Morningness-Eveningness Scale - Disorders of Circadian Disruption