HOW CIRCADIAN RHYTHM CONTROLS YOUR ENERGY, HEALTH, AND BODY COMPOSITION—AND HOW TO OPTIMIZE IT

* Circadian biology has a massive influence on metabolic health and energy levels. Disrupted circadian rhythm leads to dramatically increased rates of disease, increased body fat, reduced lifespan, and chronic fatigue.

* Many hormones and hormone receptors have circadian rhythms of expression, and disrupted circadian rhythm disrupts this whole hormonal symphony.

* Circadian clock genes control signaling proteins that are intimately linked with your energy levels (NAD+/SIRT1). If you have low levels of these proteins, your mitochondria won’t work well, you will be chronically low energy.

* In short, if you care about your health and your energy levels and how fat or lean you are, you better take circadian rhythm habits VERY seriously.

Here is a summary of what you can expect if you have disrupted vs. optimized circadian rhythm:

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<th>DISRUPTED CIRCADIAN RHYTHM</th>
<th>OPTIMAL CIRCADIAN RHYTHM</th>
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15 Strategies You Must Implement to Optimize Circadian Rhythm:
There are 4 Major Zeitgebers for Circadian Rhythm:

1. Light
2. Movement
3. Nutrition
4. Temperature

So if you want a strong circadian rhythm, you want to be addressing all 4 of these layers of optimizing your circadian rhythm. Here is the breakdown of the 15 most important habits to optimize your circadian rhythm.

1) Get Bright Light At The Beginning of The Day.
   * Bright light (ideally sunlight) is critical to set the circadian rhythm.
   * Needs to happen within the first 30 minutes of the day! In that first 30 minutes after you wake up, you should either be getting sunlight outdoors (or staring at the bright sky) or, if you live in a very overcast place in a northern latitude, then you should use a light therapy box on overcast mornings.
   * Morning light is the main signal telling your brain when it’s day and when it’s not

2) Block Out Blue Light After Sunset.
   * Blue light at night will alter gene expression of circadian clock genes and disrupt the whole hormonal symphony that relies on proper circadian signaling.
   * Specifically, it will suppress melatonin and phase shift circadian rhythm.
   * It will also blunt the normal rise in prolactin and growth hormone at night, which has profound consequences on your health—accelerated aging, increased risk of cancer and neurodegenerative disease, and blunted energy levels.
   * After the sun goes down, you want to minimize or eliminate your exposure to blue light.
   * The indoor house lights that you use at night in your house should be lamps that have amber or red bulbs. (Here are my recommended options: HERE, HERE, HERE, and HERE).
   * Blue blocker glasses should ideally be worn for at least 1 hour prior to bedtime, preferably 2 hours. (Here are my recommended options: HERE and HERE).

3) Follow the meal timing, nutrient timing, and other nutrition strategies for optimizing your circadian rhythm.
* We are going to cover this in Module 2 next week, as far as the specifics of meal timing, nutrient timing, and food choices. The foods you eat not only directly impact your energy levels, but also affect circadian rhythm, which further impacts your energy levels.

* Make sure to watch the Nutrition Module!

Why does it matter?

**So you’re not functioning TOMORROW on YESTERDAY’S PROTEINS!**

Light controls the central circadian clock, but feeding/fasting cycles are a dominant factor in controlling peripheral circadian clocks in our tissues.

* At the protein level, a healthy cell will progress through a daily cycle of alternating metabolic states directed by the circadian system, with proteins going through cycles of being synthesized and degraded.

* During periods of fasting, cells release nutrients for re-cycling and remove damaged or unnecessary organelles (cellular structures). This is known as autophagy. In the liver and other tissues, this progression is controlled by your circadian clocks.

* For now, we’ve mainly talked about having at least a 12-hour fasting window at night and having at least 2-3 hours after your last bite of bed before bed.

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**4) Complete Darkness at Night While You Sleep**

* Most homes have terrible setups as far as shades/curtains that don’t fully block out light from cars and streetlights outside. You should correct this by getting Blackout curtains. I recommend these [HERE](#).

* If you have to, use a sleep mask. ([This is the one I recommend](#)).

* Night lights (even red ones) are not a good idea to have on all night. Light sources anywhere in you house should only be used while you are awake. When you go to sleep, you should turn off all light sources.

* Even a tiny amount of light (like 5 lux) for just a minute can throw off circadian rhythm. (Reference for comparison... bright light devices are 10,000LUX and sunlight is 100,000Lux.) This amount is often present just from ambient light from street lights outside windows. Even these low light levels have been linked to disrupted circadian rhythm, weight gain, and poorer health outcomes.

* This may sound extreme, but that’s only because the modern electronic human world we have created in the last few decades is fundamentally incongruent with human biology. So you do have to be a little extreme about light.
5) Fast For At Least 3 Hours Before Bed, and Preferably 4

* Your last bite of food should occur no closer than 3 hours before bed. Late-night eating is going to blunt circadian rhythm and degrade your energy levels (and make you fatter) over time.

* This is necessary for proper leptin signaling entering the hypothalamus at night. Insulin (which comes from both protein and carbs) and the high fatty acids in the blood (from dietary fat) will impair leptin signaling in the brain and disrupt optimal metabolic processes, including various aspects of the hormonal symphony of the circadian rhythm.

* It’s also critical to having an adequate fasting period during the night, which is necessary for proper autophagy. Adequate fasting window at the right time (during the night) is critical for the body to recycle old damaged proteins and build new fresh ones.

* If you feel hungry before bed or at night, you must increase your calories in the day.

* If you have poor metabolic health, the body will have trouble regulating blood sugar with this big of a fasting window and going for several hours between dinner and bed. So make this shift to earlier dinner SLOWLY and PROGRESSIVELY to avoid side effects from hypoglycemia. Shifting to earlier times slowly and progressively will allow you to avoid this.

* One of the most important aspects of this is facilitating the prolactin surge in the night, and the growth hormone surge, which is important in regulating body composition. This happens when you give your body at least 3 hours of fasting before sleep.

6) Reduce Psychological Stress

* Psychological stress will throw off your circadian rhythm.

* Stress hormones (CRH, cortisol) have the effect of delaying the circadian rhythm. This is why night owls are more of an anxious phenotype.

* And it’s not only psychological stress. Anything that activates your HPA axis or stress response is included. (Sleep deprivation, overexercising, inflammation, disrupted circadian rhythm, stimulants, poor nutrition, fasting/skipping meals, smoking, high alcohol consumption, infections, pain, obesity, etc.

* Meditation, mindfulness, prayer, massage, laughing, sex, yoga, reading, dancing, music, etc.

* (If you need help with this, I recommend this program and this one.)
7) Time The Bulk of Your Daily Activity During Daylight Hours. Be Active During the Day, and Try to Workout During Daylight Hours. Don’t Exercise a Few Hours Before Bed

* Movement and activity is synergistic with the other zeitgebers (light, temperature, and meal + nutrient timing). It amplifies the circadian signal. In other words, intense exercise should be done during the daytime to reinforce the daytime signal. Just as you don’t want bright light at night, you also don’t want intense exercise at night.

* Not exercising within 4 hours of going to bed is a good idea.

* Exercising at around 5pm can sometimes be ideal for sleep, but don’t exercise at 9pm and go to sleep at 11pm. (More on optimal exercise timing is coming in the exercise/movement module).

8) Get Your Temperature Dialed In

* New research indicates that temperature plays an important role in circadian signaling in hunter gatherers.

* Colder temperatures are a major signal for night time that trigger sleepiness.

* Warmer temperatures in the morning trigger wakefulness.

* Counterintuitive: Cold in the morning can switch on your body’s heater. Heat in the late evening followed by getting out of the bath/shower/sauna can cause a drop in temperature which triggers sleep.

* Being in too cool of an environment during the day (like always being indoors in air conditioning) and too warm an environment at night will blunt your circadian rhythm. You SHOULD have a large change in temperature between your daytime temperature and nighttime temperature if you want to optimize your metabolic health and energy levels.

* Use this knowledge and program your thermostat accordingly. You want to be warmer during the day, and you want your house to get cooler 1-2 hours before you want to sleep. You can also program it to start to warm up a half hour before you get up in the morning. (This is a simple but POWERFUL concept! Use temperature to amplify your circadian rhythm, enhance your energy levels and deepen your sleep!)
9) Optimize Your Sleep.

* This is a big topic, so we’re devoting an entire section to it. See the document that covers the 17 Key Sleep Habits.

* Most people think it’s just a matter of getting your 7-8 hours of sleep. Wrong! Even more important is to maximize your sleep latency and sleep efficiency—this will maximize the amount of rest and rejuvenation your body is actually getting.

10) Start Your Day With Movement.

* You want to increase Cyclic AMP (cAMP) Right After Awakening

* cAMP is an important cellular signalling molecule that resets the circadian rhythm and helps tell the brain that it’s daytime (synergistic with light, temperature, and food).

* The best way to increase cAMP is EXERCISE and movement. It doesn’t have to be intense exercise—walking outside, Qigong, yoga, pilates, etc. … or intense exercise also works, if you’re so inclined.

  * Light exercise is best if your metabolic health is poor and you’re already fatigued with poor body composition.

  * Intense exercise can be used for those with already decent metabolic health and energy levels.

11) Use Sound To Entrain Circadian Rhythm.

* Human-animal co-evolution: The calls of songbirds influence circadian rhythms.

* One study in humans…Ten subjects spent two 4-day lab sessions in constant dim light. Between 1 AM and 3 AM, before the core body temperature minimum was reached, on the second and third nights of each session, half were subjected to a 2-hour CD of bird calls set to classical music at an intensity equivalent to normal human conversation (not loud); the control half were subject to a blank CD they were told contained an auditory stimulus “above the human hearing range.” Both groups experienced delays in dim light melatonin onset (DLMO) – “a reliable marker of circadian rhythm phase” – and core body temperature (CBT) phases, with the group receiving the auditory stimulus experiencing significantly greater delays. Self-reported feelings of fatigue were also lower in the auditory stimulus group.
* Other advice: Wake up with gentle soothing noise or the calls of songbirds. Then shift into music that energizes you. At night, in the few hours before bed, keep the volume of any noise (TV, computer, conversation, etc.) relatively low.

12) Know Your Chronotype and Adjust Accordingly

What is My Chronotype?

* As far as the ideal timing of your light exposure, the critical thing to do here is to determine what chronotype you are. **Chronotype is essentially a measure of whether you are more naturally a “morning person” or a “night person” and thus when you are mentally, physically, and behaviorally at your best each day. This is also referred to as being a lark vs. night owl, or “morningness” vs. “eveningness.”**

* Fortunately for us, there is actually a standardized questionnaire that has been scientifically verified to be accurate for this very purpose, the **Horne-Östberg Questionnaire**, which will give you an accurate profile of where you fall on the chronotype spectrum. You can find that questionnaire [HERE](http://www.cetsurveys.com/index.php?sid=61524&newtest=Y). And it will also tell you when your natural peak in melatonin is (provided you don’t have electronic screen light blaring into your eyes at night), when your natural bedtime is, and when the optimal time is for you to do your morning “light shower.”

* If you’re naturally a late chronotype and you’re one of those people that has been that way all your life (i.e. you haven’t entrained yourself into that rhythm by staying up late chronically), then there are a few things you should consider:
  
  * **Asking your boss if he is okay with you taking a slightly different schedule:** If your boss is able to understand your needs as a night owl chronotype, they may potentially be sympathetic. And in some cases, may be willing to allow you to work a schedule with a later start and end time to the work day.

  * **Becoming your own boss:** If the above option doesn’t work, and if you’re struggling to get into work on time and not able to be productive in the morning, consider becoming your own boss and operating on your own schedule.

  * **Avoiding smoking and drinking.** Among late chronotypes who smoke and/or drink have higher rates of depression. (Note: This is not necessarily that substance abuse causes depression, and perhaps the direction of causation could even be the opposite. But until we know for sure, it’s probably a good policy to avoid smoking/drinking in excess.)
* **Shift your circadian rhythm to be more conducive to your workday:** If you can’t reschedule your work day or become your own boss, then the best strategy is likely to treat your situation in the same way someone who is a day chronotype and has to work a night shift—entrain your circadian rhythm to the times you need to be awake, alert, energetic and productive. This means intentionally limiting your blue light exposure in the evening starting 2-3 hours earlier than you would normally wind down for bed. And setting your alarm clock to wake up slightly earlier than normal and doing light therapy immediately upon waking up.

* Whether you find a way to work with your natural night owl chronotype or end up having to entrain yourself into a slightly different circadian rhythm, make sure to take care of this one way or another, because having a circadian rhythm aligned with your social/work rhythm is critically important.

* In addition, there are also dawn simulation devices, which I also strongly recommend—not as a replacement for a light box, but as a supplement to it to help you wake up with greater ease.

* Here are a few choices of light boxes you can buy if you live in a place where you can’t get outdoors to get morning sunlight for a large part of the year. [HERE](#), [HERE](#), and [HERE](#).

**SUMMARY OF HOW TO USE LIGHT**

* **Sources of light:** Natural sunlight from being outdoors, dawn simulation devices, and lightboxes.

* **Intensity & wavelength requirements** There are two options here: Getting outdoors or using a bright light box. (Also using a dawn simulation device). For light boxes, pick a device that emits the full-spectrum of the visible light at 10,000 lux (measured at the level of the eyes of the user!)

* **How far away from the light should you be?** First, you want the light to be entering your eyes indirectly, so don’t stare directly into the light. The ideal distance away you’re your face is approximately 8-24 inches from the light source. (Obviously if you’re using sunlight as your light source, this does not apply).

* **What’s the right time of day to do light therapy?** The best time is in the morning, at the time based on your MEQ score. (Unless you’re a night shift worker or otherwise intentionally trying to adjust your circadian clock to an unnatural sleep-wake cycle.) In addition to this morning session (which is the most important thing), light sessions—either with the light box or by going outdoors—can be done in 5-10 minute microsessions throughout the day to instantly boost energy.
* **How much light is the right dose?** You ideally want to be outdoors on a bright sunny morning, or if that’s not possible, you want to go a lamp that emits light at 10,000 lux and use it for 30 minutes. Note that doing more than 30 minutes in the morning doesn’t have significantly more benefits. 2-15 minute microdoses can be used during the day at regular intervals.

* **How long before your circadian rhythm shifts?** Some effects of light on arousal will be immediate, but for the overall shift in circadian clock, it will usually take 3-7 days for the effect to set in. (Note: If you stop doing it, you will of course, lose the effect).

The most important thing to keep in mind here is this:

**Compared to your average cup of coffee or energy drink, there is simply no contest—the effects from a 30-minute morning light shower are more powerful, longer lasting and way more far-reaching.**

13) **Stand More During the Day and Sit Less**

* The time for being active is the daylight hours. The time for sitting and rest is at night.

* The more you sit during the daytime, the more you tell your body it’s the time for rest, and the more you blunt circadian rhythm amplitude.

14) **Get Rid of Chronic Inflammation, Oxidative stress, Mitochondrial Dysfunction**

* If you have chronic oxidative stress, inflammation, hypoxia or mitochondrial issues, then fix it.
* Each of these disturb your circadian rhythm and they are also increased by a disturbed circadian rhythm, creating a bad vortex.

* Your mitochondria are supposed to be more active in the day and you’re supposed to utilize oxygen, which results in superoxide. Bursts of superoxide will help you create new mitochondria.

* When your mitochondria are working well, you will build up healthy levels of ATP and NAD+ levels, which are important for energy utilization and metabolism. Healthy levels of these will allow you to be alert and energized in the day and tired by night fall. How?

* The mitochondria creates ATP. ATP converts to cyclic AMP, which is a critical messenger molecule for so many cellular processes. cAMP is needed for the regulation of glycogen, sugar, and lipid metabolism. The phosphates from ATP activate proteins that act directly on the cell’s ion channels. Through PKA/CREB, it leads to the production of gene products. The following hormones also require adequate cAMP levels to function optimally: FSH, LH, ADH (V2=kidneys), TSH, CRH, hCG, ACTH, MSH, PTH, GHRH, Glucagon and Calcitonin. Cyclic AMP turns on PKA, which converts ATP into AMP, which ends up converting to adenosine. Adenosine builds up throughout the day and causes you to feel tired as the day goes on. Orexin also has a sharp drop off and you feel like you need to go to sleep.

* If your mitochondria aren’t working, you don’t produce optimal levels of ATP, cyclic AMP, AMP and adenosine.

* For your mitochondria to work well, you need: Clean well-oxygenated air, movement to stimulate mitochondrial biogenesis and blood flow, food quality nutrients, and ample sunlight.

* Chronic inflammation and/or oxidative stress or sedentariness will cause your mitochondria to become inefficient at producing cellular energy. Ultimately, this will blunt circadian rhythm.

* Practical: These issues are corrected by following all the advice in the nutrition, light, movement, and other sections of this program.

15) Routines are Powerful Ways to Entrain Your Circadian Biology. Exercise on a schedule. Eat on a schedule. Get in bed on a schedule. Sleep on a schedule. Wake up on a schedule.

* There is a ton of power in just the simple act of getting yourself on a rigid schedule in how your day unfolds.
* Doing the same things at the same times of day entrains your physiology to do those things. Constantly shifting things around blunts circadian rhythm, and energy.

* (There is more specific guidance on the specifics of nutrient timing and meal timing in the nutrition modules, more specific guidance on sleep in the sleep module, and more specific guidance on exercise/movement in the movement modules).

You now have 15 powerful news strategies to optimize your circadian rhythm, prevent disease, and enhance your energy levels.

Use them wisely, and start using them TODAY!