Bipolar Disorder, Light, and Darkness

***How Light Affects the Brain***

You know about rods and cones, right? Those are the two kinds of receptors in your eyeball, on your retina, for light. But you didn’t know that there is *another* receptor for light in the eye. Whereas the rods and cones send information to the visual cortex (the “occipital cortex”, at the back of your head), this other light receptor sends its information to your internal clock. The nerve cables from these receptors don’t even go to the vision centre at all. They go straight to the middle of your brain, to a region of the hypothalamus called the suprachiasmatic nucleus, which is well known to be the location of the biological clock for us humans. You know about this clock, right? Everybody has one: it’s the gizmo that is setting your biological rhythms every day — when you feel like eating, when you feel like sleeping, when you feel like getting up in the morning. It’s the gizmo that gets confused by east-west travel, causing “jet lag”. It regulates hundreds of chemical reactions all timed to match the natural cycle of days and nights in our environment. Or what used to be our environment. Nowadays we’ve altered that environment in many ways, of course. One of the most significant changes in our environment is our ability to have LIGHT when we used to have DARKNESS.

But our brains were not built for this. There were built for a regular period of darkness within every 24 hours. Some people are not very strongly affected by our artificially lit environment. But some people, perhaps especially those with bipolar disorder, may suffer when they get too little, or too much.

**From the retina, to the biological clock: then what?**

Your biological clock resets itself every day by the appearance of morning light. That’s why you can, over a few days, adjust your clock if you fly to some other continent, or even across one. As you may know, our biological clocks are not perfect 24-hour machines. They drift a little bit every day. Most people drift toward a longer day (their clock takes more than 24 hours to complete a cycle). This is probably why most people find it easier to stay up late than to wake up early. For some people, that drift toward later hours can be very dramatic. They don’t stay glued to “real time” very well. They need to avoid getting “unglued” any further. And light at night may be one of the most important ungluing factors.

**So, how does the clock reset itself?**

Here’s the short answer: every morning light turns off a chemical process and allows the clock process, which is a very interesting string of chemical reactions, to start all over again. Clock researchers have identified all the important molecules in this process. Lo and behold: lithium directly affects one of the key enzymes in the resetting of the clock. Here we find “ground zero” of our biological rhythms, the very center of the clock process, and there’s lithium right in the middle of it.

**Light is central to biological rhythms — and so is DARKNESS**

If light starts the clock every day, is it possible that darkness is a necessary ingredient as well? Look at the question this way: sleep deprivation can cause manic episodes. In part that’s too little sleep itself — but might part of the story be “too much light?” Generally when people are sleeping less and heading toward mania, they’re not hanging out in the dark. They’re up late at night in very well-lit places, like casinos, roadways with bright car lights in their eyes, their office preparing the big talk that will secure their future millions, and so forth. They’re not sitting in some dark room. Is there any chance that being forced to stay in the dark during an emerging manic episode could actually turn them in the other direction?

Here’s another angle on light and dark: suppose that the appearance of light every morning can reset your clock only when you’ve had enough darkness. Maybe the brain needs to be able to see the contrast? What would happen if you didn’t get enough darkness? Maybe you’d lose your biological rhythm entirely; your body wouldn’t know when to make you sleep and when to wake you up. You’d be up in the middle of the night sometimes, for days in a row, backwards to real time. Then you might be so asleep during the real day you could hardly get out of bed; getting up in the morning would feel like getting up from sleep in the middle of the night does for the rest of us, ugh.

And finally, imagine that if your clock cuts loose from real time, you lose even the 24-hour connection. Remember, the clock is not really a 24 hour machine in most people. Maybe you would lose your rhythm entirely so that your body could not do the sleep thing, or the really awake thing, at any time, on any day. You’d have no idea where you were, in terms of body cycling, totally erratic. Extreme forms of “rapid cycling bipolar disorder” look just like this: no rhythm at all.

**Treatment Implications**

There are two aspects of this story with major implications for treatment of bipolar disorder: first, sleep and rhythm; and then, darkness and light (particularly one kind of light).

**Sleep and Rhythm**

This one’s pretty simple. Everybody needs sleep. But people with bipolar disorder need to protect it. Sleep deprivation is associated with having manic symptoms. But perhaps even more important than sleep, or at least as important, is rhythm: the sleep needs to happen at the same time every day to keep your clock organized. Move it around too much and you may be setting yourself up for cycling, perhaps even the harder to treat version, “rapid cycling”.

Thus most people with bipolar disorder will not be able to do “shift work”, where the work day is rotating around the clock. That’s probably about the worst kind of job schedule you could arrange.

***So, the treatment bottom line***: have regular sleep hours — even on weekends. I know, it’s going to feel really stupid to be getting up at 6 am on a Saturday. You’ll probably have to conduct some personal tests to find out if this is really worth it. I’ll admit: even if it’s theoretically a good idea for the long run, you’ll probably never be able to keep it up unless you discover some shorter-term benefit as well. So keep some mood/energy/sleep records and see what you think. Most importantly go to bed and more importantly get up at the same time every morning.

**Darkness and Light**

In my opinion, everything you just finished reading suggests that if you have bipolar disorder, you should very deliberately manage your exposure to light and darkness, especially darkness. I think this may be as important for some people with bipolar disorder as regular sleep. Obviously the easiest way to arrange this would be to make sure you’re getting good quality darkness when you’re asleep. That means no nightlights (in one study, as little as 1/500th of midday sunlight, just 200 lux, was enough to disturb people’s melatonin, the sleep chemical in our brain means don’t turn on the lights in the middle of the night if you get up to go to the bathroom (no hallway nightlight either). Don’t let early morning sun, in the summer hit your closed eyelids (which means using, if you have to, a $3.50 sleep mask you can buy at the pharmacy. You’ll get used to it. Older guys who have to get up to urinate anyway can put it on before going back to sleep in the middle of the night).

No nightlights? (35% of new mothers use them; not good. Of course, the cell phone is worse: 59% ! ) You can use nightlights, actually, but they have to emit *no blue light*, as you’ll see in the next section.

***Alert, Alert: watch out for blue light at night.***

Recent research has shown that one particular kind of light is the key to regulating the biological clock: blue light. The bottom line: blue light is a powerful signal telling your brain “it’s morning time, wake up!”  The last thing you’d want to be doing right before bed is looking at a blue light. Uh oh. You can see it coming, can’t you: what colour is the light from your television? How about from the computer screen or phone you’re staring at right now?

The good news is this: you might be able to *significantly* regulate your bipolar cycling, and at least find it easier to go to sleep at night (without medications like zolpidem (Ambien), lorazepam (Ativan), trazodone, etc.), by avoiding blue light at night.

**So, here’s the treatment recommendation**: no TV or phone/computer after 9 pm if you’re going to bed at 10 or 11. End the TV/compute/phone even earlier if you go to bed earlier. I’ve had quite a few patients tell me this step alone really helped them. Turn on the blue light blocking features on your iphone, ipad, android – check your settings under “light and brightness” if you must use them.

A related step, recommended by Dr. Dave Avery, the light researcher at the University of Washington: get dimmers on all the lights you use after 9 pm and start turning them down around that time. This encourages the release of your sleep hormone: Melatonin. In particular, avoid going in to brush your teeth at 10 pm and turning on the shaving lights! It’s just the wrong message to be sending your brain at that hour. If you have to use some sort of “night light” to guide your way to the bathroom in the middle of the night, use one that emits no blue light.

During the day get bright sunlight into the back of your retina. Eat lunch outside. Go for a walk with your sunglasses off. Expose yourself to bright sunlight – particularly in winter.