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Having Time

(Ladies and Gentlemen, Your Biological Clock is Ticking)

By Jae Gruenke

You've probably felt the thrill of stealing hours that don't really belong to you. You've stayed up all night for work or pleasure, you've traveled to a different time zone, or you work rotating or overnight shifts. But you have certainly also felt the pain that results; you're exhausted and unable to experience the part of the day that's *supposed* to be yours, and your body's basic functions are in disarray. You wonder whether you're just tired, or whether there's more to it than that.

There are a number of different cycles that govern our bodies. Most of them are connected to the earth's cycle of daylight and darkness, and from this master cycle our body clocks get their name: circadian rhythms, from the Latin *circa*, about, and *dies*, or day. Light entering our eyes passes through a nerve pathway called the retino-hypothalamic tract to the suprachiasmatic nucleus (or SCN), a cluster of brain cells in the hypothalamus, just above the optic nerve. The SCN passes this information on to the pineal gland and the hypothalamus, which together affect the sleep-wake system, as well as the digestive, cardiovascular, immune, and endocrine systems. The more natural light you see, the more all of your internal rhythms will harmonize with the local pattern of light and dark. As a child of the 20st century, you can schedule your own sunrises and sunsets by using only artificial light – if office lights and table lamps are the brightest things you ever see, they will act as your sun. If you exert total control over light and dark in your environment and never interact with anyone else, your days will naturally lengthen to 25 hours and you will cycle through the calendar living 350.4 days in the time the rest of us see 365 sunsets. If you are a laboratory mouse with your SCN burned out, your activities will lose their pattern.

However, if you work the night shift, you will have to negotiate conflicting rhythms. The sound of daytime traffic, telemarketers who call midmorning, and the activities of your diurnal family will constantly remind you when daytime really is, as will the sun you see rising when you leave work. "Light isn't the only thing that keeps us synchronized," says Scott Campbell, PhD, Director of the Human Chronobiology Lab and Professor of Psychiatry at Cornell Medical School. "Social cues and self-imposed schedules are also important." You'll probably exploit another of your body's cycles, the sleep drive, to propel you into sleep after you've been awake for a long time regardless of the hour, but even if you do it for years, your body may never completely adjust. The daytime momentum of the world around you will keep you always somewhat out of synch with yourself.

If you take an airplane to another time zone, you've changed all the cues – light, social, schedule, everything. You may at first be aware of that funny feeling you get when a record skips, and soon after you'll want to be asleep or awake at the wrong time. Ditto for hunger. Sleep specialists say that you can't change your schedule by more than an hour or so per day without pharmacological help, so it could take a while sleep well on local time. But if, for instance, you've traveled twelve time zones from home, it may take as long as three weeks for your digestion to work right. The reason for this, according to Campbell, is that aside from the sleep-wake system, the body clock is pretty hard to shift. Joyce Walsleben, PhD, Director of the Sleep Disorders Center of NYU Medical Center, recommends getting your sleep-wake system in synch with local cycles of light and dark right away, which

may help entrain the rest of your bodily functions. “The best way you can change things when you have to is using light, because it’s light that’s the real pulse for your circadian clock.”

The reason you’re not as intelligent, eloquent, knowledgeable, witty, socially savvy, and wise when you’re jetlagged is that your brain functions best when your body temperature is rising, which it does during your personal version of morning. In your personal afternoon, it dips and you may feel like napping. It rises again through the evening, and begins to fall an hour or two before what will feel to you like bedtime. If your activity is out of synch with this clock, you’re not going to feel particularly good. This also explains why it’s so difficult to make headway on your English paper between 1:00 and 4:00 am, but then after you nap in the very early morning you feel okay for a while. When you crash later in the day, though, it won’t be because you messed your body clock up. It still knows what time it is – reckless behavior on a single night isn’t enough to affect it. By the time you’ve been awake 26 or so of the past 30 hours, you’re less brilliant and articulate than usual because you simply didn’t get enough sleep.

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