Beating Jet Lag

From long and tedious security checks to cramped seating for most of us in economy class, it is a wonder that people choose to fly at all. While first-class seating is still a luxurious experience for those with the means to afford it, even the most comfortable seats on a cross-oceanic flight—indeed, even the increasing availability of seats that can be rendered horizontal to facilitate sleep—do not protect their passengers from the scourge of jet lag.

The reality is that, in addition to discomforts that compromise the ability of passengers to sleep on planes, changes in time zones have biological consequences that result in a real syndrome commonly called “jet lag.”

Jet lag hardly ranks as a serious disease, and is usually considered a mere nuisance following air travel across three or more time zones, when its symptoms become apparent.

Yet many air travelers suffer from it, and it has occasionally affected world leaders in affairs of state. For example, in 1956, Secretary of State John Foster Dulles, upon returning to Washington from Egypt, reportedly angry that the Egyptians had bought Soviet arms, declined to support the Aswan Dam project, following which the Egyptian leader, Gamal Abdel Nasser, nationalized the Suez Canal and brought promoted Soviet interests in the area. Later, Dulles noted that he had committed an error in judgment as a result of jet lag. For his part, President George W. Bush attributed a loss of direction during a visit to China to jet lag. Similarly, the rest of us may well have even experienced the awkwardness of unavoidably falling asleep at the work desk or a dinner table just after a long international flight.

The term jet lag refers to a specific cluster of symptoms that result from flying across time zones in either a westerly or an easterly direction. The most common symptoms of jet lag are feelings of drowsiness or lethargy, a tendency to fall asleep during the day, or, conversely, to be unable to fall asleep at night, or to wake up too early in the morning. Jet lag may be associated with physical symptoms that result from having to stay awake when your body tells you it’s bedtime. It can also result in difficulties in thinking and concentrating that can impair efficiency and judgment.

Jet lag, also known as “desynchronosis,” occurs after a flight across several time zones when the traveler’s biological rhythms are out of sync with those of others living in the time zone of one’s destination.

This essay will concentrate on how to use the primary zeitgebers (time-signals) of bright light and darkness to shift those rhythms. A number of people use melatonin as well. Because melatonin is not yet available as an FDA-regulated product (thereby providing no assurance of drug dosage or quality) and because the placebo-controlled trials of melatonin for the treatment
of jet lag have yielded unclear results even if some users swear by it, that product is beyond the scope this essay.

The severity of a person's jet lag depends on several factors. Most important of these is the number of time zones crossed during the flight. Rapid crossing of one or two time zones rarely results in significant jet lag, because our bodies easily and quickly adapt to one or two hour changes in our sleep and activity cycles.

On trips between the West Coast of the United States and Western Europe, however, the traveler will cross nine time zones and severe symptoms of jet lag might result. In one study it took travelers who crossed this number of time zones an average of 12 days before they recovered completely from their jet lag.

A second factor is the direction of travel. Travelers flying eastward tend to have a harder time adjusting to the new time zone that those traveling westward. When you travel in an easterly direction, you will need to set your wristwatch ahead to a later time. Night will come sooner than in your time zone of origin and you will need to go to sleep earlier and wake up earlier than you would have needed to had you never taken the flight. For the first several days after arrival at your destination, however, your body rhythms will tend to make you want to go to sleep later and wake up later than those living in your new time zone. It is necessary to shift your rhythms earlier to bring them in sync with the new time zone—and the sooner the better. It is a more difficult task for most people to go to sleep earlier than usual than it is for them to stay up later than usual, which is necessary when one travels in a westerly direction.

The body's clock has a rhythm of its own. Even if you were to stay in a dark cave for many days without any access to the outside world and without knowledge of the time of day, the body clock would continue to dictate a pattern of sleeping and waking in a rhythm of slightly longer than 24 hours. It is this tendency for our intrinsic rhythms to exceed 24 hours in length that makes it easier for people to shift their rhythms later rather than earlier and to adjust to westward as opposed to eastward travel. If you were completely isolated from all external time cues, your biological rhythms would, over time, drift out of sync with the daily rhythms of the outside world. Under normal circumstances these rhythms run in sync with the 24-hour day-night cycle because environmental influences, especially light and darkness, reset the clock each day and keep them in harmony.

To shorten the process of adjustment to local time we can take advantage of what we know about the influence of internal time cues on our clock and their effects on our biological rhythms.

**The Importance of Light and Dark**
Exposure to light versus darkness at different times of day results in different degrees of change in the biological clock. Based on early research of this principle, Drs. Alfred Lewy and Serge Daan used their predictions about the effects of bright light on human circadian rhythms to modify the symptoms of two individuals who travelled to Europe from the West Coast of the United States, a trip traversing nine time zones. They treated one with a carefully timed regimen of light and darkness that was intended to enhance adaptation to the new time zone, and the other with a regimen calculated to delay adaptation. Their predictions were borne out when the first of the two subjects adjusted to the new time zone within six days whereas the second took more than 12 days to adjust. This essay follows the timing principles developed by Lewy and Daan (though other regimens may also be effective).

It is important that these interventions be carried out at just the right times, since exposure to light (or darkness) at the wrong times can actually have the undesirable effect of making your jet lag worse and delaying your adjustment to the new time zone.

The general principle of what is called a PRC (a phase response curve) is that exposure to light in the early part of the night tends to delay circadian rhythms—that is, to push them later so that one wants to go to sleep later. On the other hand, exposure to light in the later part of the night and early part of the morning tends to advance circadian rhythms—that is, to push them earlier so that one wants to go to sleep earlier.

At some time during the night the so-called "switch-point" occurs—the point that separates the time when light delays circadian rhythms and the time when light advances them. In most people the switch-point of the PRC probably occurs around 4:00 A.M, although in some people it will be earlier and in others later. Just before the switch-point is the time when exposure to light leads to the most profound delays in circadian rhythms. In other words, if you are exposed to bright light at, say, 3:00 A.M., then, over the ensuing days, you will tend to wake up and go to sleep later than you would otherwise have done. Conversely, just after the switch-point is the time when exposure to light leads to the most profound advances. In other words, if you are exposed to bright light at, say, 5:00 A.M., then over the ensuing days you will tend to go to sleep and wake up earlier than you would otherwise have done.

Clearly then, an understanding of this switch-point, and the opposite circadian effects of exposure to light on either side of it, is central to developing strategies for averting or minimizing the jet lag that ordinarily occurs after you fly across time zones.

At this point, it would be useful to understand what it means to be exposed to light or to darkness.

Light exerts its influence on the biological clock via direct nerve connections between the eyes and the brain. It is the exposure of your eyes to light or to darkness that influences your
circadian rhythms and therefore affects your adjustment to a new time zone.

Never stare directly at the sun or at very bright incandescent lights, such as halogen lights, since this may be harmful to the eyes. Artificial light that is not diffused by a screen is concentrated in very bright "hot spots" that can injure the eyes. In addition, some people suffer from certain eye conditions, particularly those involving the retina, that can be made worse by bright light. If you believe you may be suffering from such an eye problem, be sure to consult your doctor before exposing your eyes to bright light of any type. In all situations, considerations of safety should be given priority over those involving minimizing the symptoms of jet lag.

Indirect natural sunlight is the best type of bright light for resetting your biological clock and helping you to overcome jet lag. It is often possible to be exposed to natural sunlight at those times when such exposure will help you avoid jet lag.

During times when avoiding light is called for, the darker the environment the more likely it is to have the desired effect on your circadian rhythms. During daylight hours, you could wear an eye mask when you sleep, or a pair of dark glasses (preferably the wrap-around type) when you're awake. Do not wear dark glasses in any situation where it is critical that you be able to see clearly.

Activity and Rest

Although most research into the effects of environmental time cues in both animals and humans has focused on the role of light and darkness, there is mounting evidence that other factors also play an important role. Chief among these are activity and rest, which can therefore also be used to help you overcome jet lag. Research suggests that activity might play a role similar to that of light in shifting circadian rhythms. In attempting to minimize your jet lag, it is therefore generally desirable to be active at those times when you should be exposed to light. It is quite likely that combining light and activity may actually have a more powerful effect than each of those factors alone.

Just as activity appears to have an effect on circadian rhythms similar to that of light, so rest may work in a manner similar to dark. You may do better to remain at rest at those times of day when you need to be exposed to darkness. In situations where you are unable to be in the dark at the required time, resting by itself may be helpful.

Special Advice for People with Unusual Sleep-Wake Patterns: "Night Owls" and "Early Morning Types"

The directions as to when you should be exposed to light and to darkness are geared toward
those individuals with typical sleep-wake patterns - that is, those who usually go to sleep between 10:00 and 12:00 and wake up between 6:00 and 8:00. Those whose patterns of sleeping and waking fall outside this range should adjust the directions accordingly.

For example, if you usually go to sleep after 12:00 A.M., add extra time onto all the instructions, hour for hour. Say your usual sleep onset time is 1:00 A.M., your usual wake up time is 9:00 A.M., and the instructions tell you to avoid light and minimize activity at 5:00 P.M. in the time zone of your destination, instead put on your dark glasses at 6:00 P.M. in the time zone of your destination. For those of you who normally go to sleep and wake up early, subtract from the times given in the directions the difference between your times of sleeping and waking and those "typical times" mentioned above.

So, after this introduction, what formula could you use?

Use the following time convention: ITZ=Initial Time Zone, TZT=Time Zones Travelled.

Try this for travelling east:

Overnight 1:
  Between 10 pm and 4 am ITZ, avoid light and minimize activity.
  From 4 am until 7 am ITZ maximize light exposure and activity.
  Your switch-point is now likely around 2 am ITZ.

Overnight 2:
  On your first night at your destination, avoid light and minimize activity between 7 pm and 2 am ITZ.
  The next morning at your destination, maximize light exposure and activity between 2 am and 5 am ITZ.
  Your switch-point is now likely around midnight ITZ.

If TZT is 6 or greater, you will want to go through at least one more adjustment cycle, as described here:

Overnight 3:
  On this second night at your destination, avoid light and minimize activity between 7 pm and midnight ITZ.
  On the next morning, maximize light exposure and activity between midnight and 3 am ITZ.
  Your switch-point is now likely around 10 pm ITZ.

Try this for travelling west:
Day 1:
   If you are leaving before 10 am ITZ, avoid light and minimize activity as much as possible before 10 am ITZ.
   From 11 pm until 3 am ITZ maximize light exposure and activity.
   Between 4 am ITZ and 10 am ITZ on the first overnight of travel, avoid light and minimize activity.
   Your switch-point is now likely around 6 am ITZ.

Day 2:
   Maximize light exposure and activity between midnight and 3 am ITZ.
   Avoid light and minimize activity between 6 am and 12 pm ITZ.
   Your switch-point is now likely around 8 am ITZ.

If TZT is 6 or greater, you will want to go through at least one more adjustment cycle, as described here:

Day 3:
   Maximize light exposure and activity between 1 am and 4 am ITZ.
   Avoid light and minimize activity between 8 am and 2 pm ITZ.
   Your switch-point is now likely around 10 am ITZ.

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Dr. Oren, MD, Fellow of Morse College, Yale University, and Walter Reich, MD, Yitzhak Rabin Memorial Professor of International Affairs, Ethics & Human Behavior, and Psychiatry & Behavioral Sciences, George Washington University, wrote How to Beat Jet Lag: A Practical Guide for Air Travelers. This book, written with Norman E. Rosenthal and Thomas A. Wehr two decades ago, inspires much of this essay.