Circadian Rhythm Disorders

An overview of circadian rhythm disorders including symptoms, impact on health, and treatments.

Alaska Sleep Clinic

Contents

Chapter 1

What is the Biological Clock?

Your circadian rhythm is an ingrained biological clock that regulates the timing periods of tiredness and wakefulness throughout the day. Your body clock is calibrated by the appearance and disappearance of natural light in a 24-hour period.

The term circadian is derived from the Latin "circa diem" meaning "approximately a day".

The functions of your circadian rhythm are based in the part of the brain known as the hypothalamus. Within the hypothalamus are a group of cells known as the suprachiasmatic nucleus (SCN), which is connected to optic nerves that sense changes in light.

The SCN is also responsible for regulating many body functions that revolve around the 24-hour cycle including:

- Body temperature
- Heart rate
- Blood pressure
- Hormone release (including melatonin)

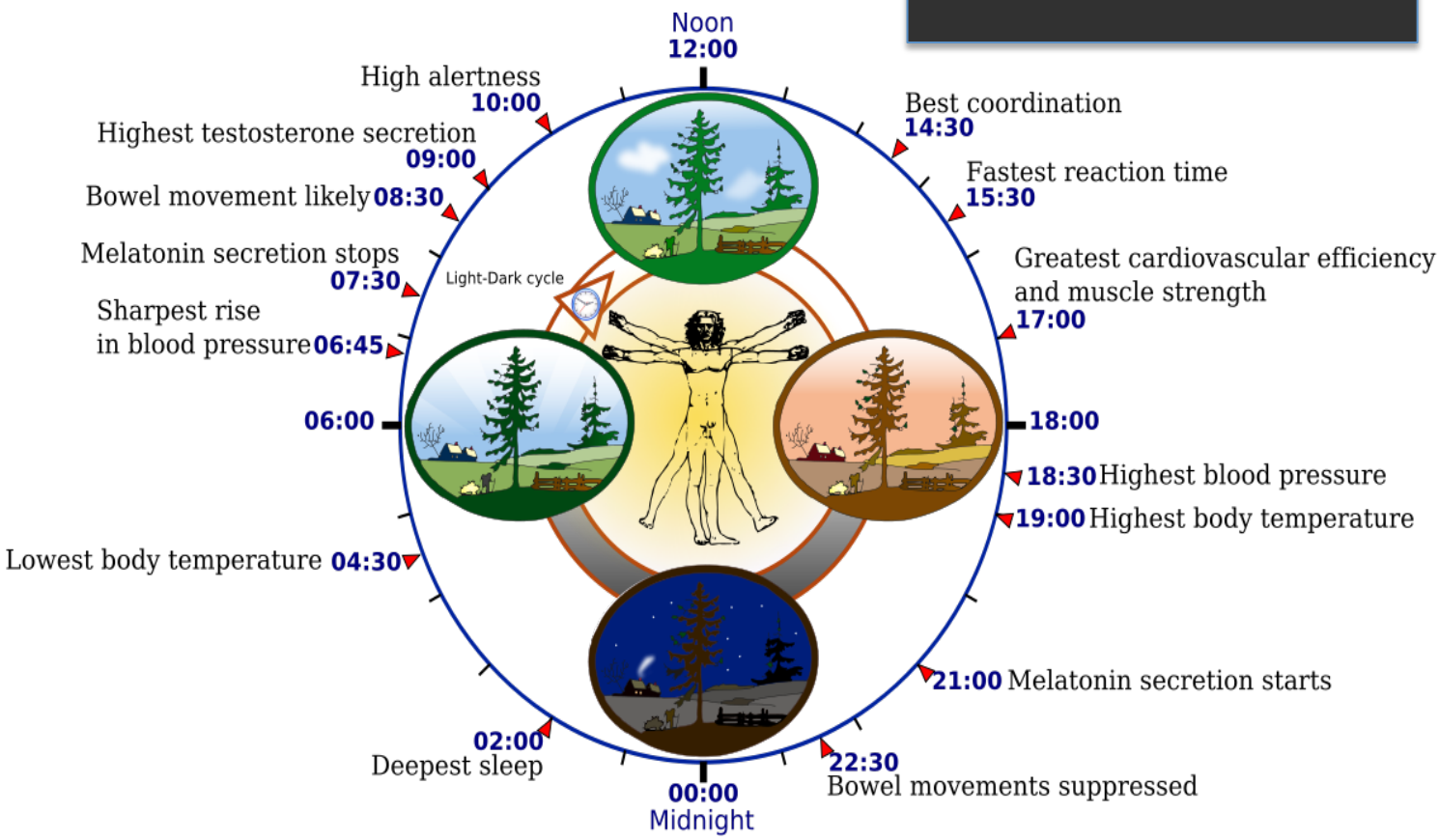
How Your Body Clock Works

In the morning when light first hits the eyes, body temperature and blood pressure begins to elevate, heart rate increases, and the is a delay in the production of melatonin, which helps people wake up.

Throughout the day the circadian rhythm increases, and even has a dip during midday, before decreasing at night as the body's functions slow down and melatonin begins to release again, preparing the body for sleep.

For most people, the body clock is set for sleep to begin around 11 p.m. and end around 7 a.m. Although there is some deviation for each individual, this clock is the standard norm. Most people are sleepiest between 2-4 a.m. and again between 2-3 p.m. (although most rarely nap), and most alert in the early mornings and late afternoons.

Some people's circadian rhythms are different, and their bodies respond differently at times that are irregular to to others.
Other people work jobs, or have school schedules outside of normal times to meet the growing demands of a 24-hour society.
Conflict is created when people's circadian rhythms don't sync-up with everyone else's, which can lead to the development of a **circadian rhythm disorder.**



What are Circadian Rhythm Disorders?

There are two basic categories of circadian rhythm sleep disorders: those that are intrinsic (built-in), and those that are extrinsic (circumstantial).

Intrinsic disorders are those in which a person's body clock is substantially "off" from the rest of societies. It can either be that they go to sleep and rise later than usual, go to sleep and rise earlier than usual, their sleep time occurs later and later each day, or their sleep is broken up into fragments throughout a given day.

Extrinsic disorders are those in which the person's circadian rhythm is in-sync with typical light/darkness patterns, but due to factors such as work, school, or travel demands their biological clock is disrupted by their uncommon schedules.

Chapter 2

Delayed Sleep Phase Syndrome (DSPS)

Delayed sleep phase syndrome is characterized when a person generally feels tired later at night than most people causing them to stay up later at night and wake later in the morning.

For those with DSPS, melatonin production doesn't usually begin until 2 or more hours later than it does in most others, and the hormone doesn't stop releasing until 2 hours later than most others as well.

People with DSPS have the same sleep needs as those with regular circadian rhythms.

Sufferers of DSPS run into trouble when their body clock doesn't match up with work or school schedules. These people often find themselves having to rise earlier in the morning than their body is prepared for causing them to lose a few hours of sleep on most nights.

Many people with DSPS complain of late night insomnia, excessive daytime sleepiness, and have an increased risk of depression.

DPSP can be found in people of all ages, but is most common in teenagers (about 7%). It usually develops around the age of fourteen and lasts into the early to mid twenties.

Because DSPS is so common in teenagers, there is some headway being made to change school start times to reflect the sleep needs of teenagers.

Chapter 3

Advanced Sleep Phase Syndrome (ASPS)

Advanced sleep phase syndrome is a disorder in which people feel sleepy earlier in the evening causing them to go to bed earlier than most others. It is similar to DSPS in that people with the condition require the same amount of sleep as everyone else, but instead feel the need to go to sleep two or more hours earlier and rise two or more hours earlier.

For sufferers of ASPS, melatonin levels and body temperatures cycle much earlier than in most other people. Many people with ASPS complain of early morning insomnia, insufficient sleep, and excessive daytime sleepiness. People with ASPS are also at a higher risk of depression.

Advanced sleep phase syndrome can affect both men and women equally, but is more common in the elderly. Roughly 1% of middle-aged people and older experience ASPS.

Chapter 4

Non-24-Hour Sleep-Wake Rhythm

People who have non-240hour sleep-wake syndrome (aka free-running disorder) have a circadian rhythm that is out of sync. It causes them to have slightly longer than 24-hour sleep cycles and causes their body clock to shift to later bedtimes every couple of days, making them go to sleep and rise at later times each day.

Non-24-Hour sleep-wake syndrome is most common in blind people. The disorder is believed to be caused by the failure of light to reach the SCN, which allows the circadian rhythm to “run free” rather than be regulated by patterns of light and dar

It is believed that as many as half of totally blind people suffer from the disorder. Non-24-hour sleep-wake syndrome is less understood in people with regular vision.

Chapter 5

Irregular Sleep-Wake Rhythm

Advanced sleep phase syndrome is a disorder in which people feel sleepy earlier in the evening causing them to go to bed earlier than most others. It is similar to DSPS in that people with the condition require the same amount of sleep as everyone else, but instead feel the need to go to sleep two or more hours earlier and rise two or more hours earlier.

For sufferers of ASPS, melatonin levels and body temperatures cycle much earlier than in most other people. Many people with ASPS complain of early morning insomnia, insufficient sleep, and excessive daytime sleepiness. People with ASPS are also at a higher risk of depression.

Advanced sleep phase syndrome can affect both men and women equally, but is more common in the elderly. Roughly 1% of middle-aged people and older experience ASPS.

Chapter 6

Shift-work Sleep Disorder

Shift-work is characterized by working hours outside of the traditional 9 a.m. to 5 p.m. schedule. It includes the early morning shift, late evening shift, night shift, and rotating work schedules.

Shift-work sleep disorder occurs when a person's circadian rhythm comes into conflict with their work schedule and is characterized by insomnia or excessive daytime sleepiness.

Approximately 20% of the U.S. workforce performs shift-work. In many industries that offer 24-hour services to customers, hiring employees for shift work becomes an unavoidable necessity.

Many employees with set schedules such as early morning shifts and night shift can adapt to their schedule if it is regular. However, people working rotating schedules are at most risk of developing the disorder, as the irregular schedules can wreak havoc on their circadian rhythm.

Typical shift-work occupations include law enforcement officers, firefighters, military members, health care workers, retail clerks, convenient store employees, restaurant staff, truckers, airline pilots, flight attendants, and many more.

Chapter 7

Jet Lag

Jet lag is a physiological condition that disrupts a person's sleep due to rapid travel across multiple time zones. Jet lag most often occurs two or more time zones away from one's home.

At the new location the person has to adjust to a new sleep-wake cycle that is often at odds with their circadian rhythm. Depending on the distance and direction travelled can impact the severity of jet-lag symptoms.

Jet lag only occurs when traveling in westward or eastward directions two or more time zones away. Jet lag does not occur when traveling northward or southward (even over long distances) unless multiple time zones are crossed.

Depending on the direction of travel, symptoms can vary. Eastward travel, where time is "lost," will have different effects on the circadian rhythm than westward travel where time is "gained."

For most travelers, jet lag is a temporary condition that can be quickly remedied and rarely requires professional intervention or therapy. However, for frequent flyers it can become a recurring problem.

Symptoms of Jet lag include:

- Disturbed sleep
- Insomnia
- Daytime fatigue
- Difficulty concentrating
- Stress
- Confusion
- Trouble functioning
- Headaches
- Irritability
- Stomach problems

Chapter 8

Treatments

Depending on the type of circadian rhythm disorder one has will vary the treatment options. Treatments can include behavior therapy, bright light therapy, and medications. Talk with a sleep specialist about which treatment options work best for you.

Behavior Therapy

- Practicing Sleep Hygiene
- Avoiding naps
- Shifting bedtimes by advancing or delaying the internal clock by going to bed a few minutes earlier or later each night until desired wake time is achieved
- Getting regular exercise
- Avoiding caffeine, nicotine, and other stimulants a few hours before bed
- Adjusting exposure to daylight

Medications

Certain medications may be prescribed depending on the disorder being treated.
Wake promoting agents or sleeping aids may be prescribed.
Melatonin, the hormone that helps regulate sleep, may be prescribed to be take at certain times of the day to help reset the circadian rhythm.

Bright light Therapy

Light therapy can be used to help delay sleep through the use of a high intensity light box. Bright light therapy helps in calibrating the circadian rhythm by having the user sit in front of the light box at appropriate times of the day (depending on the disorder being treated) for a varied amount of time as per doctor's recommendations.