An equation means nothing to me unless it expresses a thought from God
Basic Sleep Health

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Disclosures

None
Overview

1. A brief history of Sleep Medicine
2. The neural nature of sleep
3. Normal sleep duration
4. The impact of sleep deprivation on health
Egypt

Beatty Papyrus (1359 BC)
- dream interpretation - contrary predictions

Ebers Papyrus (1600 BC)
Treat insomnia:
- wine
- opium poppy
- scopolamine derived from belladona

Hypersomnia treatment:
- bloodletting
Greece

Artemidorus of Daldis (2nd century BC)

Oneirocritica
- book 1 - anatomy and body activity during dreams
- book 2 - objects and events in the natural world
- book 3 - miscellaneous
- book 4 - dream interpretation

Hippocrates (460-370 BC)
“sleep is due to blood going from the limbs to the inner regions of the body”
- opium poppy for insomnia

Aristotle (384-322 BC)
- sleepiness induced by food
Greece

Democritus (420 BC)
-insomnia due to unhealthy diet

Leucippus of Miletus (430 BC)
-atomism theory
-sleep is caused by the splitting off of atoms
China

Remedies for Sleep Problems (2600 BC)
- acupuncture
- herbs
- massage
- breathing exercises
- moxibustion

Chuang-Tzu (300 BC)
“everything is one; during sleep the soul, undistracted, is absorbed into the unity; when awake, distracted, it sees the different beings”
India

Vaishvanara
“The heavens are his head, the sun his eyes, the air his breath, the fire his heart, the water his stomach, the earth his feet, and space his body”

Taijasa
“The second quarter (Pada) is Taijasa whose sphere of activity is the dream state, who is conscious of the internal world of objects”

Prajna
“Neither dreams nor desires, a state of unification in which the spirit is no longer scattered”

Turiya
“It is unperceived, unrelated, incomprehensible, uninferable, unthinkable and indescribable. It is the cessation of all phenomena; It is all peace, all bliss”
Jean Jacques d’Ortous de Mairan (1729)
- chronobiology of plants
- heliotrope plant leaves close in dark and open in light
- intrinsic circadian oscillations and environmental entrainment
Hans Berger (1928-30)

- first to record human EEG
- described EEG alterations in sleep and wake
Upper brainstem and hemispheres are involved with sleep/wake
Kleitman & Aserinsky (1951-55)

-co-discovered REM sleep
Other Historical Landmarks

1957- Kleitman & Dement- described sleep stages
1959-62- Jouvet- pontine source of REM sleep
1960- Vogel- described sleep onset REM
1964- Dement & Mitchell- first narcolepsy clinic
1965- Jung et al.- first description of obstructive sleep apnea
1968- Rechtschaffen & Kales- standardized sleep stage scoring
1972- Holland et al.- developed polysomnography
1975- Association of Sleep Disorders Centers (now the American Academy of Sleep Medicine)
1981- Sullivan et al.- CPAP for treatment of OSA
What is Sleep?
THE NEUROPHYSIOLOGY OF SLEEP
Sensor at nose to measure air flow

Sensors on face and scalp measure eye movement and brain activity

Wires transmit data to a computer. A technician in a nearby room monitors the data.

Elastic belt sensors around chest and belly measure amount of effort to breath

Sensor on finger measures amount of oxygen in blood
Polysomnogram

- Electro-oculogram (EOG)
- Electroencephalogram (EEG)
- Chin Electromyogram (EMG)
Stage Wake
Stage N1 Sleep
Stage N2 Sleep
Stage N3 Sleep
Stage REM Sleep
REM Sleep Behavior Disorder
Sleep Hypnogram

Stage N3 predominates in the first half of night

Stage REM predominates in the second half of night
Normal Sleep Architecture

- Stage N1: 1-5%
- Stage N2: 50-60%
- Stage N3: 20%
- Stage REM: 20%
How Much Sleep Do I Need
Sleep/Wake Circadian Rhythm
Human Circadian Rhythms

- Hormone levels
- Activity of the Digestive tract
- Sleep
- Blood pressure
- Body temperature
Sleep duration is dictated by the sleep pressure that varies across the lifespan.
<table>
<thead>
<tr>
<th>Age</th>
<th>Hours of Sleep Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babies of 0 to 2 months</td>
<td>12 to 18 hours</td>
</tr>
<tr>
<td>Infants of 3 to 11 months</td>
<td>14 to 15 hours</td>
</tr>
<tr>
<td>Toddlers of 1 to 3 years</td>
<td>12 to 14 hours</td>
</tr>
<tr>
<td>Preschoolers of 3 to 5 years</td>
<td>11 to 13 hours</td>
</tr>
<tr>
<td>School Kids of 5 to 10 years</td>
<td>10 to 11 hours</td>
</tr>
<tr>
<td>Teenagers of 10 to 17 years</td>
<td>8.5 to 9.25 hours</td>
</tr>
<tr>
<td>All Adults starting from age 18</td>
<td>7 to 9 hours</td>
</tr>
</tbody>
</table>

Source: National Sleep Foundation
Why Should I Sleep?
Self-reported Sleep-related Difficulties Among Adults ≥20 Years, 2005-2006 & 2007-2008

- Concentrating on Things: 23.2% (49.2 mil)
- Remembering Things: 18.2% (38.8 mil)
- Working on Hobbies: 13.3% (28.2 mil)
- Driving or Taking Public Transportation: 11.3% (24.0 mil)
- Taking Care of Financial Affairs: 10.5% (22.3 mil)
- Performing Employed or Volunteer Work: 8.6% (18.3 mil)
Sleep restriction

Change in control of food intake
- ↓ leptin
- ↑ ghrelin

↑ opportunity to eat

↑ hunger
- ↓ satiety

Altered food selection

↑ Increased energy dense food intake
<table>
<thead>
<tr>
<th>HOURS OF SLEEP</th>
<th>BODY MASS INDEX</th>
<th>LEPTIN</th>
<th>GHRELIN</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>increases 14.9%</td>
</tr>
<tr>
<td>5</td>
<td>increases 3.6%</td>
<td>decreases 15.5%</td>
<td></td>
</tr>
</tbody>
</table>
Take Home Points

1. There are key historical scientific landmarks in Sleep Medicine
2. Sleep is an active neurobiologic process that can be categorized into stages of REM and NREM sleep
3. The amount of required sleep varies with age and regulated by our internal circadian rhythms and sleep debt
4. Sleep deprivation has deleterious consequences on our health including a risk factor for developing obesity
References

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