Science of Sleep: Link to Good Health

Wendy Hileman, PhD, MPH, MSW, MS

Background

- CEO/CFO Healthy Adventures Foundation
- Education
  - Ph.D. in Organizational Psychology, specializing in employee wellness programs and evaluation
  - Master's Degrees: Organizational Psychology, Public Health and Social Work
  - BS: Athletic Training/Physical Education
  - AS: Intelligence Collections
- Part-time professor at USC and Southwestern College
- US Air Force Veteran

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Healthy Adventures Foundation's background and mission

- Non-profit, specializing in health and wellness programming and development for communities, organizations, groups, and individuals for seniors, adults, employees, and children
- We seek to improve quality of life, while seeking balance in healthy behaviors.
- We manage the employee wellness programs for school districts, non-profits, public entities, and for-profit organizations.
- We also run the recreational youth wellness programs for Polinsky Childrens Center, high-risk after school programs and school-based and library based after-school programs.

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Agenda

- All about sleep
- Different needs for sleep
- Difficulties with sleep
- Understanding sleep
- Strategies for better sleep

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Why do we sleep?

Sleep homeostasis

- Adenosine build up throughout the day. Once it passes a certain threshhold, the onset of sleep occurs.

- Reference: Lee, K., Landis, C., Chasens, E., Dowling, G., Merritt, S., Parker.K., Redeker, N., Richards, K., Rogers, A., shaver, J., Umlauf, M., Weaver, T., 2004. Sleep and chronobiology: Recommendation for nursing education. Nursing Outlook, 52, 126-133.

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Why do we sleep?

Circadian rhythms

- Our biological clock that synchronizes to day/night mode.
- Located in the brain in the suprachiasmatic nucleus (SCN)

- Reference: Lee, K., Landis, C., Chasens, E., Dowling, G., Merritt, S., Parker.K., Redeker, N., Richards, K., Rogers, A., shaver, J., Umlauf, M., Weaver, T., 2004. Sleep and chronobiology: Recommendation for nursing education. Nursing Outlook, 52, 126-133.

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Why do we need sleep?

- Restoration
- Brain processing
- Memory consolidation
- Framework strengthening = improved problem solving

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Reference: Russell Foster (March 2, 2014). Why do we sleep? TedTalk 2014. Ted.com

Newborn and Infant Sleep

- Newborn sleep has 2 stages:
  - 50% “quiet or non-rapid eye movement (NREM) sleep” and 50% “active or rapid eye movement (REM) sleep”
- Total sleep time = 16 to 17 hours / day with frequent awakenings for feeding and nurturing

Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Children Ages 1-5 Years

- Amount of total sleep time 11 to 13 hours / day
- Generally sleep through the night
- Nap during the day as needed

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Sleep in Middle Childhood (5-12 years)

- 10-12 hours/day
- May experience ***parasomnias*** (sleep problems) such as enuresis (bedwetting), nightmares, and sleep walking

Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Sleep in Adolescents (12-18 years)

- 9 hours / day
- Often experience delayed sleep phase syndrome …. can't go to sleep until late at night and prefer to sleep later in the morning
- Frequently do not get sufficient sleep

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Sleep in Adulthood

- 7.5 to 8 hours/day
- Increasing frequency of problems sleeping including common sleep disorders such as obstructive apnea, insomnia, and restless leg syndrome

Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Sleep in Aging Adults (65+ years)

- 7 to 8 hours/day … may decrease to as little as 6 hours a night with naps common during the day
- Increased number of nighttime awakenings
- Frequently awaken very early in the morning
- Sleep may be impacted by illness and medications

Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Sleep in its Natural State

- Without daylight, our natural sleep state is:
  - 8p-12 am sleep
  - 12-2 am quiet wakefulness – meditative
  - 2-6 am sleep
- Those allowed to return to natural sleep state report better wakefulness, more productivity and a feeling of being more rested.

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Reference: Jessica Gamble (September 15, 2010). Our Natural Sleep Cycle is Not. TedTalk 2010. Ted.com

Average Hours of Sleep in the US

- Adults – 6-6.5 hours/day
- Teens – 5 hours/day
- Seniors - <5 hours/day
- Shift workers – 5 hours/day

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Reference: Russell Foster (March 2, 2014). Why do we sleep? TedTalk 2014. Ted.com

Sleep problems can be associated with many conditions including:

- Stress and environmental factors
- Pregnancy
- Menopause
- Chronic pain
- Major depression
- Chronic illnesses such as cancer, cardio-pulmonary disease, and Alzheimer's

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Common Sleep Problems

- Parasomnias – include sleepwalking, bed wetting, nightmares and night terrors (all common in children), nocturnal sleep related eating disorders, and bruxism (teeth grinding)
- Sleep disorders – include insomnia, obstructive sleep apnea, restless leg syndrome, and narcolepsy

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Insomnia

- Trouble falling asleep or staying asleep
- Related to stress, anxiety, hormonal changes, lifestyle, environmental factors, physical ailments, or psychiatric illness
- May be transient (lasting less than 4 weeks), short term (1-6 months) or chronic (> 6 months)

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Obstructive Sleep Apnea (OSA)

- Breathing stops for 10-20 seconds or more, 20-30 times an hour.
- Oxygen levels in blood drop.
- Daytime sleepiness
- Often associated with overweight / obesity and chronic disease
- Treatment = continuous positive airway pressure (CPAP), surgical, weight loss

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

STOP-BANG Sleep Apnea Test

- Male
- High blood pressure
- Snoring
- BMI > 30
- Feel tired
- >50 years
- > Neck circumference >15.7 inches

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References: STOP-Bang - Chung, Yegneswaran, Liao, Chung, Vairavanathan, Islam, Khajehdehi, Shapiro, 2008

Restless Leg Syndrome

- Neurological disorder characterized by unpleasant sensations in the legs and an uncontrollable urge to move when resting as an attempt to relieve these feelings.
- Causes difficulty falling asleep
- Cause unknown, difficult to treat

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Narcolepsy

- Chronic neurological disorder caused by the brain's inability to regulate sleep-wake cycles normally. Cause unknown.
- Characterized by frequent urges to sleep occurring anytime.
- Can be disabling due to involuntarily falling asleep at school, work, or anywhere.
- Cannot be cured, may be treated with various medications

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Reference: Barbara B. Richardson, PhD (ND). Nursing Supercourse – Sleep Basics for Health Promotion. Washington State University College of Nursing.

Poor Sleep Outcomes

Decreased

- Empathy
- Immune system
- Daytime functioning
- Alertness
- Memory
- Problem solving
- Judgement
- Glucose sensitivity

Increased

- Pain
- Obesity and weight gain
- Hypertension
- Automobile accidents
- Substance abuse – caffeine, other stimulants to maintain wakefulness, nicotine, alcohol
- Carb cravings
- Risk of diabetes

Reference: Russell Foster (March 2, 2014). Why do we sleep? TedTalk 2014. Ted.com

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Signs of Sleep Deprivation

- Irritability
- Tiredness
- Need an alarm clock to wake up

Reference: Russell Foster (March 2, 2014). Why do we sleep? TedTalk 2014. Ted.com

Understanding Sleep

- Quantity and quality of sleep are equally important
- Light sleep and REM have similar brain waves to that of being awake
- Deep sleep has delta waves, which are important for learning

Reference: Dan Gartenberg (June 2017). The brain benefits of deep sleep and how to get more of it. Ted Talk.

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Delta Waves

- Delta waves may become lessoned with aging
- Alzheimer's patients have significantly diminished delta waves
- Pulsing white / pink noise during deep sleep improves quality delta waves.

Reference: Dan Gartenberg (June 2017). The brain benefits of deep sleep and how to get more of it. Ted Talk.

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Sleep = Housekeeping

- Brain clears out waste products (beta-amyloid) in brain primarily in sleep mode
- Beta-amyloid builds up in brains with Alzheimer's disease
- Sleep therapy may a therapeutic strategy in the future for Alzheimer's disease

Reference: Jeff Ilff (September 2014). One more reason to get a good night's sleep. TedMed 2014 Talk.

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Getting Better Sleep

- Get 15-20 minutes in the morning of daylight to clear and re-start your daily adenosine cumulating
- Stop caffeine 12-14 hours before sleep – ½ life is 12 hours
- Exercise decreases anxiety and stress = more restful sleep & increased the likelihood of next day exercise

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Reference: NPR Podcast Life Kit: Do this today and sleep well tonight. March 24, 2019

Getting Better Sleep

- Minimize any alcohol consumption, which decreases REM sleep. End of sleep tries to play catch up – symptoms chaotic, fragmented marathon REM dreams
- Stop all screen time 1 hour before sleep. Screen time activates other parts of your brain, which lowers melatonin by 50% and takes 3 hours to get back to needed levels for deep sleep.

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Reference: NPR Podcast Life Kit: Do this today and sleep well tonight. March 24, 2019

Getting in the Mood

- Darkness
- Slightly cool
- Listen to your body

Reference: NPR Podcast Life Kit: Do this today and sleep well tonight. March 24, 2019

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Glycemic Index Impact on Mood & Sleep

- A dietary carbohydrate's ability to modify the plasma amino acid pattern so as to enhance the uptake of circulating tryptophan into the brain depends on its glycemic index or its ability to promote the secretion of insulin.
- Tryptophan triggers serotonin production, which is needed for melatonin. This regulates mood and sleep.

WURTMAN, R. AND WURTMAN, J. (1995). Brain serotonin, carbohydrate-craving, obesity and depression. Obesity Research, 3 (Supplemental 4):477S-48OS.

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Carbs and Serotonin Regulation

- Regular balanced eating, e.g. carbohydrate consumption, regulates serotonin, which is important for sleep onset, pain sensitivity, blood pressure regulation, and control of mood.
- People learn to overeat carbohydrates (particularly snack foods, like potato chips or pastries, which are rich in carbohydrates and fats) to make themselves feel better.
- Because people are self-medicating with certain foods as though they were drugs is a frequent cause of weight gain, and can also be seen in patients who become fat when exposed to stress, in women with pre-menstrual syndrome, in patients with “winter depression,” or in people who are attempting to give up smoking.

WURTMAN, R. AND WURTMAN, J. (1995). Brain serotonin, carbohydrate-craving, obesity and depression. Obesity Res. 1995;3 (Supplemental 4):477S-48OS.

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Vitamin D and Depression

- Activates genes that regulate the immune system and release neurotransmitters (e.g., dopamine, serotonin) that affect brain function.
- Vitamin D receptors can be found in the same region of the brain linked with depression

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Seasonal Affective Disorder

- Seasonal Affective Disorder (SAD) may be linked to the sudden drop in vitamin D levels in the body due to lesser sunlight hours, impacting serotonin levels.

https://www.psychologytoday.com/blog/the-breakthrough-depression-solution/201111/psychological-consequences-vitamin-d-deficiency

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Vitamin D and Depression

- There was a potential inverse association of vitamin D, primarily from food sources, and depressive symptoms in postmenopausal women. The higher the vitamin D, the lower the depressive symptoms.
- “Vitamin D may affect the function of dopamine and norepinephrine, which are monoamine neurotransmitters that are likely involved in depression.”
- “Vitamin D may modulate the relation between depression and inflammation.”

Elizabeth R Bertone-Johnson, Sally I Powers, Leslie Spangler, Robert L Brunner, Yvonne L Michael, Joseph C Larson, Amy E Millen, Maria N Bueche, Elena Salmoirago-Blotcher, Simin Liu, Sylvia Wassertheil-Smoller, Judith K Ockene, Ira Ockene, and JoAnn E Manson (2011). Vitamin D intake from foods and supplements and depressive symptoms in a diverse population of older women. Am J Clinical Nutr 2011;94:1104–12.

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Foods that impact mood

- Eat these foods later in the day:
  - Popcorn, turkey, pasta, and plain yogurt
    - Rich in the amino acid, L-tryptophan
      - stimulate serotonin production, lulling you into sleep
  - Spicy foods
    - Stimulate serotonin uptake

Journal of Sleep Research, 2008

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Omega-3

- Seeds and nuts
  - Omega-3
    - Natural anti-inflammatory, 2 Brazil nuts (also high in Selenium, which as additional anti-inflammatory) = equivalent to Rx dose of Motrin
    - Rich in Magnesium, which relaxes the body and calms the nervous system
      - Pumpkin seeds, almonds, and green leafy vegetables

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Flax seed

- May lower estrogen (and hormonal cancer risk), osterporosis, and heart risks
- 1 teaspoon per day, freshly ground, decreases hot flashes and night sweats by 20% in peri-menopausal and menopausal women

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Other Signs

- **Stress Arousal**: anxiety, irritability, hypertension, clenching jaw and/or grinding teeth, insomnia, palpitations, forgetfulness, and headaches.
- **Energy Conservation**: Work tardiness, procrastination, resentment, morning fatigue, social withdrawal, increased alcohol or caffeine consumption, and apathy.

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Practice Mindfulness at Work

- Take a few minutes each day to practice mindful appreciation
- Mindful breathing: 4-7-9 or count to 10 breaths
- Take a 3 minute break to clear your mind
- Mindful immersion – give what ever you are doing your full attention
- Mindful focus – one thing at a time – [illegible] multi-tasking
- Practice acceptance

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4-7-9 Breathing Exercise

- Practice any time when you are feeling stressed, anxious, or upset.
  - Start by exhaling completely through your mouth.
  - Close your mouth and inhale through your nose for a count of **four**.
  - Hold your breath for a count of **seven**.
  - Exhale completely through your mouth for a count of **nine**.
  - Repeat the cycle 1-2 more times.

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Meditation Techniques: Mindfulness of Breathing

- Step one: In the first stage you use counting to stay focused on the breath. After the out-breath you count one, then you breathe in and out and count two, and so on up to ten, and then you start again at one.
- Step two: Subtly shift where you breathe, counting before the in-breath, anticipating the breath that is coming, but still counting from one to ten, and then starting again at one.
- Step three: Drop the counting and just watch the breath as it comes in and goes out.
- Step four: The focus of concentration narrows and sharpens, so you pay attention to the subtle sensation on the tip of the nose where the breath first enters and last leaves the body.

Sleep Rituals

- Prepare for sleep 1 hour prior to going to bed
- Avoid caffeine, alcohol, spicy foods.
- Exercise at the time of day that gives you the best sleep
- Have a set sleep time (7-9 hours); same bedtime and wake time
- No computer/TV before sleep (at least one hour)
- Sleep in a dark room
- Optimal sleep temperature
- Do yourself a favor and give your pets their own beds

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The end … or the beginning?

- Have any questions?
- Contact me at:
- Wendy Hileman
- wendy@healthyadventuresfoundation.org
- 619-466-4386 ext 110

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