Academy of PHYSICAL MEDICINE

Broadcast Summary

SLEEP SCIENCE

With Neil Stanley

About Neil Stanley

- An independent freelance sleep expert
- PhD on the basis of his published works
- Involved in sleep research for more than 35 years
- Worked for ten years at the Neurosciences Division of the RAF Institute of Aviation Medicine
- Served as Director of Sleep Research at the Human Psychopharmacology Research Unit (University of Surrey)
- Has published 38 peer-review papers on various aspects of sleep research and psychopharmacology
- Professionally affiliated with the following: European Sleep Research Society, American Academy of Sleep Medicine, European Society of Sleep Technologists, British Sleep Society (Chairman 2000-2004; Committee member 1998-2000)

The science of sleep

- People know very little about the science of sleep and about how to get a good night's sleep.

- The first self-help book for sleep was published in 1889. There were four other books up until 1935.

- There are two distinct state of being during sleep: a) rapid eye movement sleep; and b) non-rapid eye movement sleep. These go in a 90-minute cycle. As to what this cycle does and why people sleep that way, etc. – no available information can explain them.

- Sleep basics:
  - Sleep is analgesic. Reducing deep sleep makes a person feel more pain the next day, while increasing it reduces the pain.
  - A healthy adult sleeps within 15 to 20 minutes after switching the lights off.
  - Taking more than 30 minutes to fall asleep is indicative of insomnia.
  - Falling asleep in less than five minutes is indicative of being sleep deprived.
  - Long sleep is just as bad for health as short sleep.
  - Sleep need is genetically determined per individual.
  - Need to have four or five REM cycles each night

The stages of sleep

Stages of sleep	Description
Stage 1: Lightest stage	• Makes up 1-5% of the night. • Lightest sleep stage - the transition between sleep and awake. • 'Sleep state misperception' happens when one is asleep but is unaware of having slept.
Stage 2: True sleep stage	• True sleep - 50% of the night. • The brain is quiet, not attending to its environment, and differentiated by a 2 wave forms: Sleep spindles (burst of brain activity/large depolarisation) and depolarisation (K-Complex). No data yet on what they do.
Stage 3: Deep, slow wave sleep	• Makes up 25% of the night. This is deep, slow wave sleep – the restful recuperative part of sleep. • The most important part of sleep for four reasons: memory, forgetting, learning, and growth. • Slow wave sleep diminishes with age. - Men start losing their slow wave sleep earlier than women – around age 35 old in men; 55 in women. - Men's memories become worse as they get older. - Men over the age of 60 sleep worse than women.
Stage 4: N3	• Now combined with stage 3. • This stage was known as the deepest part of sleep.

Benefits of deep sleep

• Physical development takes place during deep sleep (while lying down when one is not pushing against gravity)

• Practising a task before going to bed makes a person 17% better at the task by simply getting a good night sleep.

• Information gathered during the day is filed away at night during deep sleep for retrieval at another time. (e.g. A person who studies for an exam needs to read the material at least three times before going to bed. The brain will know that this is important information). Deep sleep improves information retrieval.

• Deep sleep is about factual memory; REM sleep is about the emotional aspects of memory.

Getting enough sleep

• A person's sleep needs to remain constant. (e.g. a 4-hour a night person needs to get 4 hours; an 11-hour a night person needs to get 11 hours, and so on – anywhere between 3 and 11 hours can be considered normal). The key thing about this is getting the right amount.

- Eight hours of sleep is merely an average, not ideal.

• Sleep remains fixed for life (e.g. 80-year old individuals need the same amount of sleep they needed at 25). What changes is the loss of slow wave sleep.

• With age, sleep becomes less refreshing and is also more easily disturbed.

• Children:
  - Children need a lot of sleep. All important development occurs during sleep. They have much more deep sleep and have more REM sleep.
  - A new born needs 16 to 20 hours sleep.
  - A 10-year old needs approximately 10 hours sleep.
  - Until a child is 6, they should be having at least one long daytime nap.
  - A study says 26% of 3-year olds have a TV in their bedroom – this is a real problem.

Sleep hygiene

• First emerged in 1890's, now called "clean sleep"- top ten tips for good sleep. Later an 11th tip was added – 'don't smoke'.

• But note: sleep needs vary from person to person. The guidelines are not set in stone.

Sleep disorder among children

• In the past, it is likely that children had fewer sleep problems. Until about 1980 they were put to bed at a reasonable time, read a bedtime story, then left to sleep. The modern era has changed that.

• Children who are hyperactive, putting on weight or have problems with aggression may have sleep difficulties.

• If a child eats a healthy diet, nothing else is needed to ensure good sleep.

Dreams, parasomnia, and night terror

• Everybody dreams four or five times a night. A dream can be remembered if the person wakes up during it, or within two minutes after it has finished. Generally people who do not wake during the REM period have no memory of their dreams.

• Talking in sleep is parasomnia. It happens during deep sleep and it is related to sleep walking. In deep sleep, the conscious part of the brain is very much asleep while other bits of the brain can wake up, and if they wake up, they can do the things that they are designed to do (i.e. walking, talking, etc.).
  - Sleep talking has no meaning
  - Sleep walkers do routine things that they have done before

• Night terror is where the fear center of the brain wakes up. This happens during deep sleep. A person having a night terror is not dreaming, but merely reacting to fear, without memory of it on waking.

• A nightmare is a scary dream but is more problematical than night terrors. If a child has a nightmare – there is a story to it, there is a threat, and is scared of that threat.

Sleep inertia

• The physiological state of being groggy that can occur after waking and can last between 15 minutes and 2 hours. This is common in people who sleep too long.

• The Leeds Sleep Evaluation Questionnaire is a self-rating tool that is used to define aspects of sleep and early morning behaviour.

• The most powerful change that people can make to their sleep is to fix their wake up time every single day. This is about routine - the body starts waking up 90 minutes before a person actually awakes. It is important to tell the body when to wake up so that it can prepare ahead.

• People have an ideal 10 minute window to go to sleep, called sleep gate. This is genetically determined, but is very difficult to discover! It requires days in an isolation chamber. The key is to listen to the body.

- The body has a rhythm of 24 hours and 17 minutes.
- The body is also designed to be flexible (i.e. able to cope with the 3-minute daily changes during transition i.e. night-sunrise-day-sunset.
- From an evolutionary point of view, people are not designed to cross time zones. But then, modern people live longer than the cavemen therefore time change/crossing time zones is not a health risk.

Melatonin and blue lights

• The melatonin response is a trigger for sleep, called dim light melatonin onset. When it goes dark, the body produces melatonin that dissipates through the night.

• Exposure to blue light (i.e. tablet, smart phone, computer, or TV) suppresses melatonin release. It takes about twenty minutes after exposure before the body naturally releases melatonin. People who are exposed to blue screens take longer to fall asleep, have worse sleep, and feel sleepier the next day.

- Apple has released gadgets with night modes which strip out the blue light. But the screens go dull with the night mode on, resulting to people turning up the brightness. Bright lights cause the same problems as blue lights.

- Daylight simulating bulbs are bluer. They are used in nursing homes among patients with dementia because they reduce their “sun downing” (the aggression and disorientation that demented patients get before bed).

- A person may fall asleep while being exposed to blue light (i.e watching TV) for two reasons:

  a) when all the biological needs of that person were met hence there is nothing else to stay awake for; and

  b) when that person feels safe and secure. This differs between men and women as men can switch off a lot more easily. Women have difficulty

switching off easily because they have much broader role/preoccupations. Women subconsciously sacrifice their sleep for men. They will rarely wake a man up who is snoring. Whereas men have no hesitation waking a woman up under the same circumstance.

- Exposure to powerful blue light (10,000 lux) in the morning for 30 minutes helps those with seasonal affective disorder and circadian rhythm disorder.

• Taking melatonin induces circadian rhythm in totally blind people as they do not have light perception. Blind people and autistic children are the only people allowed to take melatonin.

Anti-depressants and hypnotics

• Anti-depressants have different effects on sleep. Medications are equal in terms of their therapeutic effects but not on their side effects or behavioural toxicity.

- e.g. If a patient got insomnia because of depression and was prescribed with Selective Serotonin Reuptake Inhibitor (SSRI) which causes insomnia, then the depressive mood of the patient may be reduced but insomnia was further induced. The latter is the biggest cause of relapse in a depressed patient.

• Hypnotics stop a person from waking up, but do not improve the quality of sleep. They only allow whatever amount of sleep a person can get to happen.

The Hamilton rating scale

• A benchmark against which all anti-depressants are measured. If an anti-depressant reduces the Hamilton rating by 50%, it is an anti-depressant regardless of whatever else it does (just as a drug that induces sleep quicker than a placebo is regarded as a hypnotic/sleeping drug).

• The newer Z-drugs[1] are good for helping insomniacs fall asleep, but they do not keep them asleep.

Alzeimer's and insomnia

• People with severe insomnia have three times increased risk of developing Alzeimer's.

- Insomnia is a sleep disorder that has day time consequence like feeling sleepy.
- Insomniacs take more than 30 minutes to fall asleep or are asleep for less than 85% of the night.

• While patients with Alzheimer's have a good recall of their childhood and early adulthood, they do not have the ability to file away new memories which is purely a function of sleep.

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[1] From Wikipedia:

Z-drugs are a group of nonbenzodiazepine drugs with effects similar to benzodiazepines, which are used in the treatment of insomnia,[1] and most of whose names start with the letter "Z". Some Z-drugs may have advantages over benzodiazepines. Benzodiazepines actually worsen sleep architecture, whereas the Z-drug zaleplon (Sonata) may have less or no disruption of sleep architecture.

Effects of drugs on sleep

• Opioids are unhelpful for sleep because they wipe out the deep restorative part of sleep. Many people are on these for life because they effectively reduce pain.

• Pregabalin and Gabapentin which are licensed for neuropathic pain increase slow wave sleep in a selective way. They are not hypnotics.

• Amitriptyline is given widely for pain. It causes day time sedation but has no published efficacy on sleep.

• SSRIs which are used for pain cause insomnia.

Powernaps and coffee

• "Power naps" should not be necessary if a person is getting good quality sleep at night.

• A power nap should be 20 minutes long. But this means about 40 minutes in total, as it takes time to fall asleep.

• If a person falls asleep within a minute then that person is sleep deprived and getting a 20 minute power nap will not be beneficial.

• Power naps should not go into deep sleep, as waking during this stage will make a person feel worse. If napping for more than 20 minutes, it should last for 2 hours to miss the first wedge of deep sleep and wake in the REM stage.

• Coffee is a poor caffeine delivery system as the amount of caffeine is completely random. It is not a remedy for feeling sleepy.

• The best power nap advice is to drink two cans of a functional energy drink (eg. Red Bull) which contains controlled amount of caffeine before the nap. It takes 30 minutes for the caffeine to take effect, which is about the right time for the nap.

Differentiating 'being sleepy' from 'being tired'

• People use 'being sleepy' and 'being tired' interchangeably, but these are two different conditions. The former is caused by sleep deprivation while the latter may be a sign of problems like obstructive sleep apnea, narcolepsy, hypersomnia, or something else.

• There are four simple questions for assessing whether a person is just sleepy or really tired:

- a) How do you feel during the day?;
- b) Are you satisfied with your sleep?;
- c) Are you excessively sleepy during the day?; and
- d) Do you do anything at night that is noticeable to your partner?

- The key here is to gather the reasons for the negative answers before deciding whether there is a need for a comprehensive sleep history or a referral to the GP.

Sleep deprivation and susceptibility to injury

• There is 34% increased risk of suffering a sports related injury among people who exercise when sleepy. When people are tired at the end of a match, they are more susceptible to injury as well.

• It takes longer to recover from injury if the person is not sleeping well. A lot of sport teams now are making an effort to improve sleep, not just because of the performance benefits, but also because of the protective and recovery benefits of getting a good night's sleep.

Paperwhite Kindles, Fitbits, and sleep monitors

• The background light in Paperwhite Kindles are just as bad as the dull blue light.

• Wrist-worn sleep monitors (Fitbit, Nokia Steel, Garmin etc.) are based on the concept of actigraphy. At best they are only 35% accurate. They cannot tell anything about deep sleep or dreaming sleep. The only way to measure sleep is by measuring the brain/brainwaves.

• People tend to overanalyse sleep. It is the fear of not sleeping that is actually causing people not to sleep.

Mattresses and comfort

• The whole point with mattresses is comfort. Science cannot measure comfort. The only way a person can know the best mattress to choose is to get on it, lie on it, change position on it, etc.

• A practitioner can only guide patients on what mattress to choose in consideration of their weight, size, shape, medical condition, among others. The patients are the ones who can really determine the best mattress that gives the most comfort.

Historical figures and sleep

• Edison was a tireless worker known to fall asleep at his bench. He was a napper. But he had trouble meeting newspaper deadlines.

• Napoleon did get seven hours sleep contrary to the propaganda that he didn't sleep as much.

• There was no evidence in Margaret Thatcher's biography that she slept for just four hours a night, but in the very male world of politics, it was probably useful PR.

• Adolf Hitler is documented as requiring very little sleep.

Claims without evidence

• There is no evidence to support claims that changing the clocks in spring and autumn affects health, despite claims of a 26% increase in heart attacks as the clocks go forward.

The HPRU and sleep unit

• The Human Psychopharmacology Research Unit **(**HPRU) was set up in 1970 by Professor Hindmarch, who developed the idea of behavioural toxicity- the concept that a medication might have the unintended effect of altering behavioural factors such as memory, cognitive function, reaction time and sleep.

• A 24-bed sleep unit was later established by Dr. Stanley to look at the effects of medication on sleep. Any drug that crosses the blood brain barrier has an effect on sleep, positive or negative.

The best public repositories for sleep education

- The American Academy of Sleep Medicine @ https://aasm.org/
- The National Sleep Foundation in America @ https://sleepfoundation.org/