

Sleep and its Effect on Learning and Behaviour

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Sleep Basics:

Human sleep is composed of two basic types, non-rapid eye movement sleep (NREM) and rapid eye movement (REM) sleep. NREM sleep is separated into 4 stages, each deeper than the last (Stages 1,2,3,4). REM sleep has the distinction of having rapid eye movements and the brain appears to be very active. Dreaming occurs. Most of the deep NREM sleep occurs in the first half of the night, while most of the REM sleep occurs in the second half of the night

Sleep in Children and Young Adults

Healthy children have large amounts of NREM and REM sleep. They have much larger amounts of Stages 3 and 4 than do adults. They have few, if any, awakenings in the night compared to adults.

Circadian Rhythms

Bedtimes and wake times are precisely monitored by internal biological clocks. Children do well when they have a reasonably rigid routine. This means bedtime and wake times at virtually the same time every day. There will be unavoidable disruptions to this, but attempts should be made to adhere to a schedule, especially during the school week.

When children are allowed to go to bed later than normal, but asked to get up at the same time as always, they will be deprived of their last cycle of REM sleep – possibly 30% of the entire night's amount. This will interfere with memory consolidation.

If children do not go to bed early enough to get their quota, they will be partially sleep deprived every day. There are a number of noticeable consequences:

- 1) They do not want to eat very much breakfast (but later at school will eat junk food if they can get it).
- 2) They may sleep through the first class of the day, trying to make up the deficit. This is often the class which has new concepts introduced – such as science, math etc.
- 3) Their marks are not particularly good.
- 4) They may have social problems – being bullies or being bullied.
- 5) Emotionally are not as “together” and don't deal well with stress
- 6) They have trouble focusing.
- 7) They may be more accident prone.

Suggested Sleep Quotas

- 1) Preschoolers (ages 3-5 yrs.) - *Range of 10-13 hours*
- 2) School Age Children (ages 6-13 yrs.) - *Range of 9-11 hours*
- 3) Teenagers (ages 14-17 yrs.) - *Range of 8-10 hours*
- 4) Young Adults (ages 18-25 yrs.) - *Range of 7-9 hours*
- 5) Adults (ages 26-64 yrs.) - *Range of 7-9 hours*
- 6) Older Adults (ages 65+ yrs.) - *Range 7-8 hours*

Dietary Considerations

Foods can aid sleep onset and maintenance, but they can also interfere with good sleep. In order for good sleep to occur, there must be an abundance of the amino acid **tryptophan**. This substance is found in many protein foods and produces **serotonin** and **melatonin**, two chemicals that are required for normal sleep to occur. Another substance of great importance is **calcium**, important in neural transmission. (All of these substances are naturally occurring).

It is important to have good balanced meals that provide these items. It is also important that some foods are not taken or at least are minimized. Here are some basic rules:

- 1) Even in children, huge meals too close to bedtime lead to less efficient sleep.
- 2) Avoid all sources of stimulants such as caffeine (coffee, pop, chocolate, etc.) as they delay sleep onset.
- 3) Be aware of any food allergies or sensitivities to foods. These foods, taken at the evening meal can interfere with good sleep.
- 4) Bedtime snacks should be composed of a protein containing tryptophan and a complex carbohydrate. Here are some examples:
 - a. Small turkey sandwich (turkey + bread).
 - b. Whole grain cereal and milk.
 - c. Cheese and crackers
 - d. Hard boiled egg and toast
 - e. Peanut butter on toast and milk
 - f. Banana and milk
- 5) There are some definite food no-no's that one should also be aware of:
 - a. Carbohydrates with too much sugar should be avoided. They induce a sugar high, then sugar low, then stress hormone release.
 - b. Any foods or drinks containing caffeine.
 - c. Spicy or fatty foods
 - d. Any foods in the sensitive or allergic category
 - e. Drinks should be warm but not hot. (Hot drinks can raise body temperature and delay sleep onset.)

- f. Alcohol before bed impairs the normal functioning of REM sleep mechanisms and induces nighttime awakenings.

Environmental Considerations

Sleep environments are very important and if they are not optimal, result in poor quality sleep. A number of basic things should exist:

- 1) The bedroom should be quiet and free of all electrical devices such as iphones, ipads computers, TVs. These things keep the sleeper from sleeping.
- 2) Wind down physical activities before bed. Exercising before bed delays sleep onset. However, DO exercise. The brain needs motor stimulation as well as mental stimulation.
- 3) Emotionally exciting activities before bed also interfere with sleep onset.
- 4) The bedroom should be as dark as possible. Lighted areas reduce sleep quality.
- 5) The bed/mattress should be comfortable.
- 6) Room temperature should be cool. Some where in the 16-19^o C range. If body temperature does not drop, sleep will be blocked or poor quality.
- 7) In the same vein, DO NOT have a HOT bath just before bed. This will drive body temperature up, and sleep will not occur. *(If a bath is a must, make sure that it is done 1.5-2 hrs. before lights out.)*
- 8) Make the bedroom as dark as possible. Sleeping in a partially lit room has been shown to result in poorer quality sleep.
- 9) Bedroom should be in a quiet area away from the sounds of music or TV. *(Playing music during sleep has been shown to reduce the amount of Stages 3 and 4.)*

References

There are several reliable websites that one can search for further information about sleep matters. They include:

Canadian Sleep Society

National Sleep Foundation

<https://www.mcgill.ca/newsroom/channels/news/it's-all-good-night's-sleep-240986>

<http://aasmnet.org/jcsm/ViewAbstract.aspx?pid=29834>

<https://schoolstarttime.org/early-school-start-times/academic-performance/>

