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## A Good Night's Sleep

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### 1. Sleep (according to Zulley, 2005)

The average amount of sleep a person should get is about 7 hours. It is a continuous change of activity and rest. Our body repairs itself and recharges spent energy. Spent cells are replaced and we store new experiences. That helps not to do the same mistake twice. The body seals itself off from its external surroundings and is completely busy repairing itself. It cannot produce any external output.

The immune system is strengthened and nutrients are digested.

Ideas learned during the day are consolidated.

The body uses almost as many calories as during daytime.

Zulley pinpoints the problems of getting too little sleep here (page 38):

- Too little sleep makes sick
- Too little sleep shortens life
- Too little sleep makes people stupid

Our internal clock tells us when it is time to sleep. It also sets the daytime structure:

Our concentration is in the morning between 10 and 12 o'clock, in the afternoon around 3 o'clock, and in the evening at TV prime time. Depending on what type you are, lark or owl (or day or night person), these phases take place earlier or later.

Every person experiences these three "fit" phases. The brain is not limited to one state, neither during sleep nor awake. It needs changes between concentration and relaxation.

At about two o'clock in the afternoon our body shuts down. We experience this lack of energy after lunch.

The absolutely lowest performance, however, takes place at night between three and four o'clock. If we are awake during this time, perception is distorted, concentration is low, and we do not feel well. The person is extremely unstable and functions quite ineffectively (The darkest hour). (cf. Zulley, 2005 pages 42, 43)

Sleep is divided into different phases of rest and activity. It resembles an up and downhill ride and is not a consistent state of rest. Sleep is not a passive, but a highly active state. We need almost as many calories during sleep as when we are awake.

The activity of the brain during sleep can be recorded by monitoring in sleep laboratories. The EEG (= electroencephalography) records the impulses of different intensity, transferred from the nerve cells to the brain.

By the way: Modern sleep science started just at the beginning of the past century (1929), with development of EEG recordings.

Electrodes at the eyes record eye movements (= electrooculogram) and electrodes based at the mouth record muscle tension (= electromyogram).

This recording of sleep data in sleep laboratories is termed sleep polygraph, giving information on the different stages of sleep.

### **Different Phases**

Light sleep, light deep sleep, deep sleep and REM sleep, which is the time of dreaming. A night has 2 to 3 deep sleep phases within the first half of the night. They are interrupted by 4 to 5 dream sleep phases, recurring every 90 minutes and lasting even longer in the course of the night. Towards morning only light sleep takes place between the dream phases.

By means of the data records in Sleep research, sleep is divided in four different stages:

Stage 1 = very light sleep / REM sleep (rapid eye movement, dreams)

Stage 2 = light sleep

Stage 3 = deep sleep

Stage 4 = deep deep sleep

A healthy person goes through four to six of such cycles, depending on sleep duration, each lasting approximately 90 minutes. The depths of sleep alternates, like an up and downhill ride. Deep sleep changes to lighter sleep, then to REM sleep and back to deep sleep again.

## Deep Sleep

With increasing depth of sleep, the number of movements decreases.

Heart and pulse rate cease gradually to approximately 50 beats per minute.

Blood pressure decreases.

Muscle tension drops considerably. During dream sleep muscle tension is lowest. One could almost say, the person is more or less paralyzed. This “paralysis” prevents that dreamed movements are really carried out by the person. Here, once again, nature has made provisions.

Body temperature decreases by approximately 0.5 degree Celsius, normally being lowest in the early morning. It then increases again slowly.

In the first half of the night, meaning the first two to three sleep cycles, we spend more time in deep sleep and dream phases are relatively short.

Deep sleep makes a share of approximately 20% of the total sleep duration. At about age 40, the share of deep sleep declines. About age 60, deep sleep is normally absent.

Sleep scientists largely agree that deep sleep is functionally the most important recovery phase. After sleep deprivation, missed deep sleep is the first to be made up for.

Deep sleep is the most important part of sleep, and provides, above all, physical recreation.

Deep sleep is characterized by slowed down brain waves and relaxed muscles.

During the light sleep phase the person can easily wake up. Waking up at night is absolutely normal. Most of the time, we do not remember it. Thus, on average, a person wakes up approximately 28 times a night without remembering it later on.

As long as we are alive, our brain and all our organs are active – without pausing. During sleep nerve cells work a little slower, producing more electrical voltage. When awake, they work faster at lower voltage. But even when we are awake, our brain is not always in top form. At times we are highly concentrated, and at times our thoughts are zoning out. The brain needs this change and our internal clock makes sure for it to happen and inserts these breaks: Around 1 o'clock in the afternoon we have our afternoon slump: We barely can concentrate and many people would like to take a nap. At 9 o'clock in the morning and at 5 o'clock in the afternoon we experience a similar slump, only less pronounced.

Growth hormones (hormones are active agents that are produced by the body to influence its metabolism) are released in the first half of the night. They are responsible for the construction of cells, i.e. growth, regeneration. Parallel to the growth hormone, transmitters (interleukins) are released. They are involved in immune reaction.

### **Light sleep**

In the second half of the night the organism slowly prepares for waking up: body movements increase, the person can wake up easier, body temperature increases slowly again, and the stress hormone cortisol is released increasingly. The hormone cortisol provides energy, elevates the blood sugar level, minimizes protein conversion, impedes the immune system, and prevents further deep sleep (Zulley page 39). It prepares the organism to be properly awake in the morning. Concentration of cortisol is highest when getting up in the morning. It only increases further in stress situations. It then does not make the person awake, but wide awake. In the evening, cortisol is retarded by release of growth hormones and melatonin. REM phases are relatively short.

If a person does not sleep long enough, the cortisol level is continuously too high. This results in permanent mental stress. If sleep deprivation lasts for a longer time, blood sugar level grows and the person gains weight.

### **REM Sleep**

In the second half of the night deep sleep phases cease almost completely. Duration and intensity of dream phases increases. When we dream at the beginning of the night, phases last 10 to 20 minutes; towards morning they last up to 45 minutes.

REM is the abbreviation for rapid-eye-movement and describes the fast eye movements typical for this sleep stage. It is assumed that eyes move that quickly, because they follow quickly changing dream visions.

During REM sleep our dreams are very intense. Thus, it is the most active part of sleep. We dream in other sleep stages, as well, but we rarely remember these dreams.

Typical for REM sleep is the active brain function. Heartbeat, blood pressure, and respiration are faster and irregular.

Muscle tension is extremely low. One could almost say, the person is more or less paralyzed. This "paralysis" prevents that dreamed movements are really carried out by the person.

According to results of sleep science, dreams have an information-processing function. Experiences and impressions are processed, learned issues saved, and needless information is deleted.

REM sleep is vital for mental-emotional recreation. Cleaning up, sorting and reorganizing our experiences, learned topics, and emotional impressions night by night, creates space for new perceptions and experiences. It literally clears the head.

The physician and psychoanalyst Sigmund Freud already described many interesting dream theories in his work "The Interpretation of Dreams", published in 1900. Even nowadays they are subject of sometime intense discussions

REM sleep makes a share of around 20% of the total sleep duration. Babies dream approximately half of their sleep duration. By reaching puberty, dream sleep has decreased to around 25% and remains more or less constant up to an advanced age.

When we have bad dreams (nightmares), we wake up and clearly remember them. Nightmares occur towards morning when dream phases are very long. people dream frightening scenes. Often people are chased in their nightmares, mostly without any ability to run away due to their paralyzed muscles. Out of this fear, they wake up.

Sleep scientists attribute nightmares to mental causes. Stress and burdening circumstances of life are considered key triggers. Nightmares in adult people mostly have their causes in mental problems, or they react on extremely encumbering experiences, such as rape, murder, or natural disasters. Children, who suffer from nightmares often react on situations in movies they have watched.

Having nightmares from time to time is no reason to worry. If they occur regularly, perhaps every night, medical advice should be consulted. Often, suppressed, unsolved conflicts are triggers. Very stressful and burdening situations promote nightmares. A vicious circle starts: concentration and performance, required so badly in this situation, decrease, because we do not get the urgently needed rest at night.

Nightmares can also occur following alcohol or medication withdrawal (e.g. antidepressants, neuroleptics, sedatives and sleeping pills of the benzodiazepines group). Substances of these medications suppress dream sleep. When these preparations are discontinued, dream sleep increases severely and nightmares can occur.

Nightly anxiety (pavor nocturnus; pavor=fear, nocturnus=night) can easily be mixed up with nightmares. It is assumed the cause is not all brain areas mature with the same speed, since children and teenagers are mainly affected. They wake up directly out of deep sleep at the beginning of the night, screaming, drenched in sweat, and with racing heartbeat. They cannot or only fragmentary remember this the next morning.

**Mobility during Sleep** (cf. Zully, 2005, page 52ff)

In order to fall asleep, we need to be relaxed completely. Once we fell asleep, we hardly move. From time to time we turn at night to change contact pressure, or we stretch an arm or leg out of the blanket to regulate temperature. Mostly, we do this prior to or following a dream sleep phase. During dream sleep phases we do not move at all, we are virtually paralyzed. Also in deep sleep we barely move at all. Muscle tension decreases and the body regulates pressure only by tiny micro sized motions.

Numerously changing position at night save us from developing pressure sores. That is why persons, with limited mobility due to illness or age, are regularly repositioned to prevent these dreaded pressure ulcers (decubitus).

We change body position 20 to 60 times a night. Whereas our internal clock induces a part of the position changes, namely those shortly before and after dream sleep. Adaptability of sleep depth is decisively responsible for the number of position changes.

Position changes are divided in great or little changes, like back, belly, right and left lateral position, and little pressure relieving position changes of very sensitive body areas, like heels and elbows.

It takes only a few minutes to carry out movements. In a saggy bed, however, e.g. on vacation, movement time appears much longer to us, because we wake up frequently. At some point our body has reached the firmer edge of the bed and can come to rest, finally. As said, this might take a while.

## 2. Sleeping Problems

### **Exterior causes / environmental** (cf. Morgan, 2000, page 58ff)

Too noisy, too warm, too cold, too much light, or lacking possibility to take a preferred sleeping position!!!!

#### **Noise:**

Noise is the major cause for disturbed sleep. Sounds that we are familiar with can barely wake us up. On contrary, new sounds, even quiet ones, may easily wake us up.

#### **Temperature:**

Variations of the individual optimal temperature impair sleeping through the night rather than falling asleep. REM phases decrease. Especially when a person suffers from fever, restorative sleep is no longer possible and waking up phases increase. Here in particular, therapeutic measures should be taken to support restorative sleep that is needed in order to recover.

#### **Light:**

Light influences our inner clock. When it is dark, we want to sleep and rest. No person supposed to sleep should be exposed to permanent light at night. Even smaller light sources can have a negative influence.

#### **Sleep position:**

Every person has a preferred sleep position. To sleep sitting upright is never as comfortable as lying down to sleep. Most persons prefer sleeping sideways and are not able to fall asleep or falling back to sleep easily after an waking up phase in another position. A wrong or unfamiliar position changes the sleep phases and the body cannot relax or recover optimally.

### **Interior causes for sleep problems**(Zulley, 2005, page 53)

#### **Pain:**

Pain caused by illness and inflammation is always worse at night than in the daytime. Thus, pain therapy reaches a higher importance at night than during the day. Our body "looks" inside at night. Pain perception is sharpened.

However, some types of pain decreases at night, such as wound pain or pressure pain. That makes people sleep in positions that would cause pain during the day.

If the princess in the Fairy Tale "The Princess and the Pea" would have had a good sleep, she would not have sensed the pea.

**Sleep alteration in old age** (Schultz, 1997, page 70ff):

In advanced age sleep becomes lighter. Deep sleep phases decrease and even quiet sounds may interrupt sleep or prevent to fall asleep again. The total sleep duration in 24 hours hardly changes in advanced age, since several naps are taken during the daytime.

**Sleep alteration in dementia** (cf. Schultz, 1997, page 94ff)

Even in the early stages of dementia, waking up phases at night increase and the share of deep sleep decreases. As a consequence, the dream sleep phases also decrease. Alteration in sleep patterns runs parallel to the progression of dementia.

10% of persons with dementia sleep more in the daytime than at night (day/night reversal).

Body perception is very poor. The patients feel like falling without reaching something to hold on or the ability to stop it.

**Sleep alteration in neurologic diseases** (cf. Schultz, 1997, page 109ff)

- More time is needed to fall asleep
- Shorter sleep duration
- Fragmented sleep with frequent waking up phases
- More light sleep than deep sleep
- Generally less relaxation phases during sleep, reduction of micro motions (especially in Parkinson's)

### **Nursing care measures and interventions** (Morgan, 2000, page 15ff)

Already Florence Nightingale did not only emphasize the support of appropriate sleep in 1859, but described preservation of deep sleep as essential for good nursing care. She considered sleep among the top priorities in healthcare.

Nowadays, it can often be noticed that, especially in clinics and hospitals, and here primarily in intensive care units, this priority has been forgotten.

A caregiver cannot influence all areas of sleep. However, they can create conditions to provide the resident with the best possible sleep.

### **Sleep biography** [according to Huhn, Heilberufe (healthcare professions) 2009]

- Differentiation between day and night people (larks and owls)
- Brightness in the room
- Closed or open door
- Bedding: heavy or light
- Pillow: thick, thin, soft, firm
- Earlier coping strategies with insomnia
- Individual sleep position
- Perhaps involving families or, if possible, sleep biography even before complete nursing care is required
- Compiling sleep rituals

### **Sleep supporting measures** (cf. Huhn, Heilberufe 2009)

- Measures to structure daily routine, activities, evening walks
- Evening and sleep rituals
- Shorten the afternoon nap (½ hour at the maximum)
- Delay bed time (individually, biography)
- Cuddle blanket, familiar pillow, cuddly toy
- Sort out room temperature and lighting
- Assessment of single or double room
- Presence of staff, offering assistance instead rebuke
- Investigation of causes for restlessness at night, gathering and trying ideas
- Late night snack (milk, bananas, because of protein and serotonin content as preliminary state of melatonin)
- Alternatives for sleep medication (warm chest pads, body washing, etc.)
- Where appropriate, applying natural remedies, like valerian, hop, lavender
- Sleep tea as a part of the sleep ritual
- Offering individual sleep positions, even with immobile persons
- Appropriate mattresses

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## Selecting the appropriate mattress

Mattresses in particular can make a significant difference. Unsuitable mattresses often cause pain or worsen existing pain.

A good bed allows natural movements during sleep without problems. It does not force movements because of its discomfort, but allows movements without causing problems and without affecting sleep. In order to achieve this, the person should not sink into the mattress too much (low embracement angle). Otherwise, turning in bed becomes a tricky task, like on e.g. waterbeds, **visco-elastic (e.g. Tempur)**, or too soft mattresses.

**Waterbeds:** position changes become a tricky crawling. Pressure minimizing lying is possible, because the person sinks into the mattress quite deep (high embracement angle). An anatomic support, however, is possible only for slim persons with well-balanced proportions. Severely pronounced hip, pelvis, buttock, and belly areas sink in deeply, as well, but the displaced water causes pressure at another location

**Super soft mattresses** often are too soft and „swallow“ each natural micro motion, which makes the number of micro motions decrease in the long run.

**Alternating pressure mattresses** offer little lying comfort, provide a poor bed climate and disturb the already light sleep of elderly persons with noise.

Mattresses used especially for persons with reduced mobility should support micro motions and thus promote deep sleep.

The efficiency of MiS Micro-Stimulation® systems is due to the combination of a soft mattress and an under frame that reacts to natural micro motion and returns it to the person's body. The patient lies soft, and yet dynamic. Micro motions are supported and body perception is preserved.

The lying position is ergonomically correct, which prevents pain, as well. This makes MiS Micro-Stimulation® systems suitable not only for pressure ulcer prevention and treatment, but also for persons with dementia, neurological diseases or pain. They offer an optimal support and the basis for healthy sleep of the residents.

### Quality of results

Residents who get sufficient and, above all, restorative sleep, show improvements in their day's form:

- Improved day's form
- Improved outcome for the therapeutic process
- Less time needed for caregivers for nursing care measures
- Fixations might not be needed anymore
- Less vulnerable to other diseases

**“As you make your bed so you must lie on it”**

## Literature

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