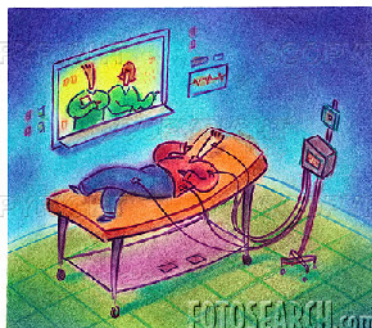


ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

Μεταπτυχιακό πρόγραμμα “ ΑΣΚΗΣΗ ΚΑΙ ΥΓΕΙΑ”  
Μεταβολικές Ασθένειες & Άσκηση



Τίτλος Διάλεξης: Διαταραχές του ύπνου και φυσική δραστηριότητα

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## Outline

- Sleep Physiology – Stages of Sleep
- Evaluation of Sleep
- Sleep Disorders
- Effect of sleep deprivation in functional performance
- Effect of Exercise training
- Tips for a good night sleep

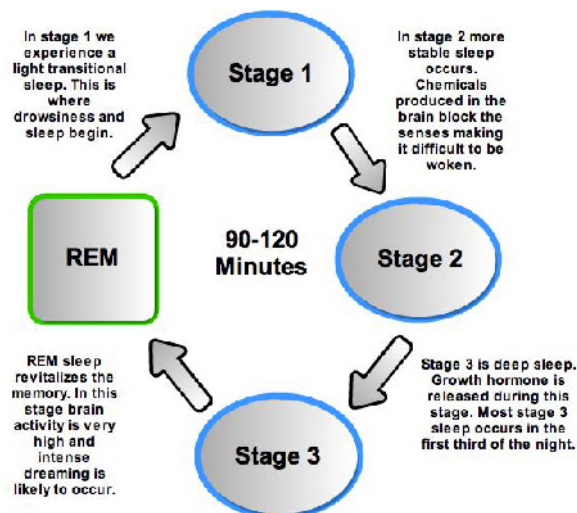


## Sleep Physiology

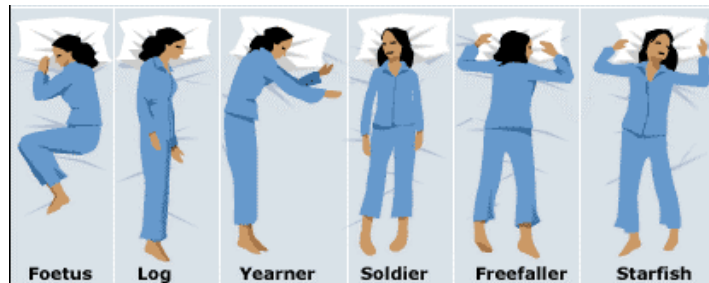
- Sleep is a state of unconsciousness (ασυνείδητο) in which the brain is relatively more responsive to internal than to external stimuli
- The brain gradually becomes less responsive to visual, auditory, and other environmental stimuli during the transition from wake to sleep, which is considered by some to be stage 1 of sleep (γλάρωμα)

## Stages of Sleep

- Wake
- Stage 1
- Stage 2
- Stage 3-4
- Stage 2
- REM
- Stage 1-2 or wake



## Sleeping Positions



- Έμβρυο – κούτσουρο – αγκαλίτσας – στρατιώτης – αλεξιπτωτιστής – αστερίας

## Sleep quality and quantity can be assessed by...

- Sleep Interview (for patient and bed partner)
- Sleep Questionnaires (Epworth Sleepiness Scale, Fatigue Severity Scale, Stanford Sleepiness Scale, Pittsburgh Sleep Quality Index, Sleep Diary)
- Full night Polysomnography (gold standard)
- Portable Sleep Screening Devices (oxymetry, air flow etc)
- Actigraphy
- Psychological Assessment (for depression and anxiety)



## Evaluation of Sleep - PSG

Using Polysomnography (PSG) method can evaluate:

- Total Recording Time – Συνολικός Χρόνος Καταμέτρησης
- Total Sleep Time – Συνολικός Χρόνος Ύπνου
- Sleep Efficiency- Απόδοση Ύπνου
- Total Wake Time – Συνολικός Χρόνος Ξυπνητού
- Wake After Sleep Onset
- Wake After Sleep Offset
- Sleep Latency – Τάση για Ύπνο –Νύστα
- Rapid Eye Movement Latency
- Stage 1, 2, 3, 4, REM
- Arousals – Ξυπνήματα



## Evaluation of Sleep

- Total Recording Time (TRT)
  - Total amount of time – in minutes – during the patients is in bed with recording equipment activated
- Total Sleep Time (TST)
  - Total time in Stage 1+2+3+4+REM in minutes
- Sleep Efficiency
  - $TST / TRT * 100$  (300 λεπτά /360\*100=83%)
- Total Wake Time
  - Total wake time in minute during TRT/TIB

## Evaluation of Sleep

- Wake After Sleep Onset
  - Sleep disruption – times of waking up during sleep
- Wake After Sleep Offset
  - Times of waking up before the end of sleep duration
- Sleep Latency (SL)
  - Is the time - from time in bed to the first epoch scored as sleep (stage 1)
- Rapid Eye Movement Latency
  - From stage 1 to stage REM
- Stage 1, 2, 3, 4, REM
  - Non REM and REM stages
- Arousals
  - Sleep fragmentation

## Sleep Disorders

- Sleep Apnea – Υπνικές Άπνοιες
- Insomnia – Αϋπνία
- Narcolepsy – Ναρκοληψία
- Shift Work – Sleep Deprivation
- Restless Leg Syndrome – Σύνδρομο Ανήσυχων Ποδιών
- Hypersomnia – Υπέρ-υπνηλία
- Bruxism – Βρουξισμός
- Sleep Terror – Εφιάλτες

## Sleep Apnea

- **Sleep Apnea** is a disorder of breathing during sleep. Typically it is accompanied by loud snoring. Apnea during sleep consist of brief periods throughout the night in which breathing stops. People with sleep apnea do not get enough oxygen during sleep.

There are 2 major types and one combination.

- **Obstructive Sleep Apnea** is the most common type and is due to an obstruction in the throat during sleep. Bed partners notice pauses approx. 10 to 60 seconds between loud snores. The narrowing of the upper airway can be a result of several factors including inherent physical characteristics, excess weight, and alcohol consumption before sleep.

**Central Sleep Apnea** - caused by a delay in the signal from the brain to breathe. With both obstructive and central apnea you must wake up briefly to breathe, sometimes hundreds of times during the night. Usually there is no memory of these brief awakenings.

**Mixed Sleep Apnea** – Obstructive and Central together

## Sleep Apnea

- **Most Common Symptoms**
  - Loud Snoring
  - Waking up un-refreshed and having trouble staying awake during the day
  - Waking up with headaches
  - Waking up during the night with the sensation of choking
  - Waking up sweating
  - Frequent trips to the bathroom during the night
  - Insomnia - problem staying asleep
  - Being overweight but not necessary
  - Waking and gasping for air



What is sleep apnea.v

## Insomnia

### Insomnia could be due to:

- Difficulty falling asleep
- No problem falling asleep but difficulty staying asleep (many awakenings)
- Waking up too early
- Sleep State Misperception



- **Three basic types of Insomnia**
- **Transient (παροδικό) insomnia - lasting for a few nights**
- **Short-term insomnia - two or four weeks of poor sleep**
- **Chronic insomnia - poor sleep that happens most nights and last a month or longer**

## Insomnia

Transient and short-term insomnia generally occur in people who are temporarily experiencing one or more of the following:

- stress
- environmental noise
- extreme temperatures change in the surrounding environment
- sleep/wake schedule problems such as those due to jet lag
- medication side effects

Chronic insomnia is more complex and often results from a combination of factors, including underlying physical or mental disorders. One of the most common causes of chronic insomnia is depression. Other underlying causes include arthritis, kidney disease, heart failure, asthma, sleep apnea, restless legs syndrome, Parkinson's disease, and hyperthyroidism. However, chronic insomnia may also be due to behavioral factors, including the misuse of caffeine, alcohol, or other substances; disrupted sleep/wake cycles as may occur with shift work or other nighttime activity schedules; and chronic stress.

## Insomnia

**In addition, the following behaviours have been shown to perpetuate insomnia in some people:**

- **poor sleep hygiene in general**
- **expecting to have difficulty sleeping and worrying about it**
- **ingesting excessive amounts of caffeine**
- **drinking alcohol before bedtime**
- **smoking cigarettes before bedtime**
- **excessive napping in the afternoon or evening**
- **irregular or continually disrupted sleep/wake schedule**

## Narcolepsy

**Narcolepsy** is a disabling disorder of sleep regulation that affects the control of sleep and wakefulness.

Symptoms generally begin between the ages of 15 and 30.





## Narcolepsy

The **2 classic symptoms** of the disorder are **excessive daytime sleepiness**;

**cataplexy** (sudden, brief episodes of muscle weakness or paralysis brought on by strong emotions such as laughter, anger, surprise or anticipation);

**sleep paralysis** (paralysis upon falling asleep or waking up);

**hypnagogic hallucinations** (vivid dreamlike images that occur at sleep onset)

## Narcolepsy

**Disturbed nighttime sleep**, including tossing and turning in bed, leg jerks, nightmares, and frequent awakenings, may also occur. The development, number and severity of symptoms vary widely among individuals with the disorder. There appears to be an important genetic component to the disorder as well.

**Excessive sleepiness** is usually the first symptom of narcolepsy.

Patients with the disorder experience irresistible sleep attacks, throughout the day, which can last for 30 seconds to more than 30 minutes, regardless of the amount or quality of prior nighttime sleep. These attacks result in episodes of sleep at work and social events, while eating, talking and driving, and in other similarly inappropriate occasions. Although narcolepsy is not a rare disorder, it is often misdiagnosed or diagnosed only years after symptoms first appear. Early diagnosis and treatment, however, are important to the physical and mental well-being of the affected individual.

## Narcolepsy

### Symptoms

- Excessive sleepiness.
- Temporary decrease or loss of muscle control, especially when getting excited.
- Vivid dream-like images when drifting off to sleep or waking up.
- Waking up unable to move or talk for a brief time.

### Simple Test for Narcolepsy:

- Do you feel like you could sleep for days and still wake up sleepy?
- Do you ever collapse or feel weak when laughing?
- Do you ever collapse or feel weak when angry?
- Are you afraid you may fall asleep while swimming?
- Are you afraid you may fall asleep while taking a bath?
- Did one of your parents or close relatives have the "sleeping sickness"?

## Restless Leg Syndrome

**Restless legs syndrome (RLS) is a discomfort in the legs which is relieved by moving or stimulating the legs. This feeling is difficult to describe and commonly referred to as a crawling, tingling or prickling sensation. Medications and exercise have been found useful**



## Periodic Limb Movement Syndrome

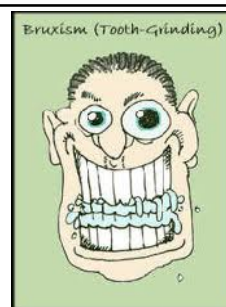
One variation of RLS is Periodic Limb Movements in Sleep (PLMS). PLMS are characterized by leg movements or jerks which typically occur every 20 to 40 seconds during sleep. PLMS causes sleep to be disrupted. These movements are typically reported by the bed partner. These movements fragment sleep leaving the person with excessive daytime sleepiness.



## Bruxism

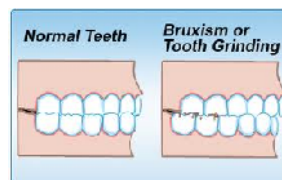
### Sleep Bruxism (Βρουξισμός)

- Sleep Bruxism is a stereotyped movement disorder characterized by grinding or clenching of the teeth during sleep. The disorder has also been identified as nocturnal bruxism, nocturnal tooth-grinding and nocturnal tooth-clenching



### What are the Symptoms?

- The symptoms of Sleep Bruxism are tooth-grinding or tooth-clenching during sleep that may cause:
  - abnormal wear of the teeth
  - sounds associated with bruxism (It's about as pleasant as fingernails on a chalkboard!)
  - jaw muscle discomfort

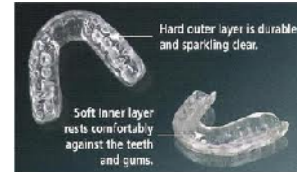


## Bruxism Therapy



### Therapy

- Stress Management
- Dental night guard
- Orthodontic treatment
- Behavioral therapy
- Reducing alcohol and caffeine
- Change sleep position



## Hypersomnia

### Hypersomnia

- Hypersomnia is excessive sleepiness. It is an excessively deep or prolonged major sleep period. It may be associated with difficulty in awakening. It is believed to be caused by the central nervous system and can be associated with a normal or prolonged major sleep episode and excessive sleepiness consisting of prolonged (1-2 hours) sleep episodes of non-REM sleep



### What are the Symptoms?

- Long sleep periods
- Excessive sleepiness or excessively deep sleep
- The onset is insidious (gradually, so you are not aware of it at first)
- Typically appears before age 25
- Has been present for at least six months

## Sleep Terror

### Sleep Terrors

- Sleep Terrors are characterized by a sudden arousal from slow wave sleep with a piercing scream or cry, accompanied by autonomic (Controlled by the part of the nervous system that regulates motor functions of the heart, lungs, etc.) and behavioral manifestations of intense fear.
- Also known as Pavor Nocturnus, incubus, severe autonomic discharge, night terror



## Sleep Terror

### How serious are Sleep Terrors?

- Some people have episodes of sleep terror that may occur less than once per month, and do not result in harm to the patient or others. While some people experience episodes less than once per week, and do not result in harm to the patient or others. In its severest form, the episodes occur almost nightly, or are associated with physical injury to the patient or others. Consult a sleep specialist if you are concerned.



## Sleep Terror

### What are the symptoms of Sleep Terrors?

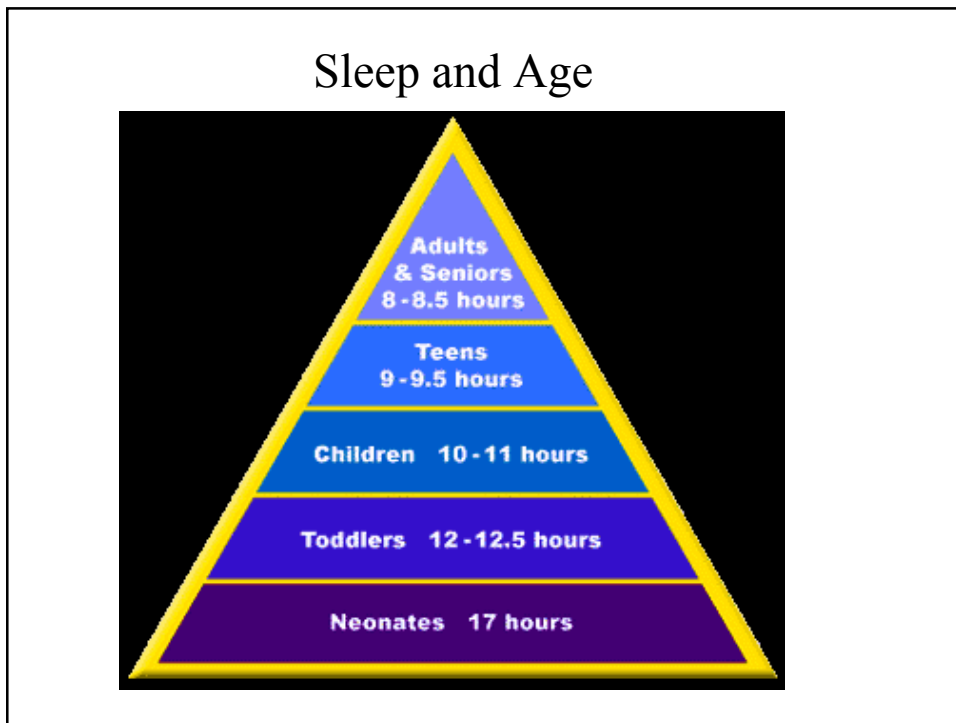
- A sudden episode of intense terror during sleep
- The episodes usually occur within the first third of the night
- Partial or total amnesia occurs for the events during the episode.
- Associated features include:
  - Polysomnographic monitoring demonstrates the onset of episodes during stage 3 or 4 sleep
  - Tachycardia usually occurs in association with the episodes.
  - Other medical disorders are not the cause of the episode, e.g., epilepsy
  - Other sleep disorders can be present, e.g., nightmares



## Sleep Deprivation

- Sleep dept of 4 hours a day for one week:
  - Increase insulin resistance
  - Increase Cortisol concentration in the evenings (memory impairments)
  - Age related disorders
- After 24 hours of sustained wakefulness:
  - the metabolic activity of the brain decreases significantly (up to 6% for the whole brain and up to 11% for specific cortical and basal ganglionic areas).
  - decrease in core body temperature,
  - a decrease in immune system function
  - decrease in the release of growth hormone.
  - increased heart rate variability.





### Sleep and Age

- Reduced % of deep sleep
- % REM is unchanged but the 1<sup>st</sup> REM is longer than the rest
- More awakenings and therefore more % in stage 1
- Increased daytime sleepiness
- Reduced sleep efficiency
- Increased numbers of naps

- Physiological changes that affect sleep
  - Nocturnal polyuria
  - Menopause
  - Decreased respiratory muscle strength
  - Physiological changes of the lung
  - Changes in soft palate tissue
  - Increased use of medications
  - Conditions causing pain
  - Neurological disorders
  - Psychiatric conditions (mood, anxiety)

## Lack of Sleep and Physical Performance

- Reduction in cognitive ability
- Mood changes
- Reduction in speed reaction
- Reduction in computational skills
- Some studies have found increased fatigability in subjects after sleep restriction

## Exercise and Sleep Disorders

### **Exercise**

- People who regularly engage in exercise have fewer episodes of sleeplessness
- Exercise promotes improved sleep quality by allowing smoother and more regular transition between the cycles and phases of sleep
- Stanford University School of Medicine researchers studied the effects of exercise on the sleep patterns of adults aged fifty-five to seventy-five who were sedentary and troubled by insomnia. These adults were asked to exercise for twenty to thirty minutes every other day in the afternoon by walking, engaging in low-impact aerobics, and riding a stationary bicycle. The time required to fall asleep was reduced by half, and sleep time increased by almost one hour



## Exercise and Sleep Disorders

### Benefits of Exercise

- Exercise reduces stress by helping to dissipate the lactic acid that accumulates in the blood.
- Exercise eases the muscular tension that can build up.
- Exercise sharpens the brain by increasing the amount of oxygen available.
- Exercise strengthens and stimulates the heart and lungs.
- Exercise vitalizes the nervous system.
- Exercise activates the endocrine system.
- Exercise increases the body's production of endorphins. Endorphin creates a sense of well-being and increases the body's resistance to pain.
- Exercise stimulates the release of epinephrine, a hormone that creates a sense of happiness and excitement.
- Exercise reduces the boredom, worry, and tension.
- Exercise improves sleep because it is a physical stressor to the body. The brain compensates for physical stress by increasing deep sleep.

Therefore, we sleep more deeply and soundly after exercise.

## Exercise can Help

### Exercise to Combat Sleeplessness

- The lack of physical activity can contribute to insomnia by inhibiting the daily rise and fall of the body-temperature rhythm. As a result, many people get caught in a cycle of insomnia, reduced energy and physical activity, and worsened insomnia
- The exercise you choose should involve vigorous use of your legs if it should help with your sleep. The fatigue produced by [using leg muscles] acts as a tranquilizer
- Aerobic exercises are the best to combat sleeplessness. These exercises increase the amount of oxygen that reaches the blood
- For many people, the ideal time to exercise is early in the morning. But for combating insomnia, the best time to exercise is at the end of the afternoon or in the early evening.
- Mild, non-aerobic exercise may help you unwind at the end of the day. Take a leisurely walk breathing deeply and allowing yourself to respond to the physical sensation of being outside.
- Gentle dancing to pleasant music can help you lift your mood and relax your body.
- Yoga and stretching exercises are good ways to wind down.

## Other ways of therapy

### *Supplements*

- **Herbs** The effects of the root of valerian (*Valeriana officinalis*) on sleep have been examined in people with sleep problems. Some studies have suggested that valerian helps with the onset of sleep and with sleep maintenance. However, more research is needed before a final conclusion can be made about the safety and effectiveness of valerian for insomnia
- Chamomile is another commonly used herb for the treatment of insomnia. The FDA considers chamomile to be safe and the herb has no known adverse effects
- Other herbs promoted as effective sleep remedies include passionflower, hops, ginseng, lemon balm and skullcap. The German government has approved certain herbs (valerian, hops and lemon balm) for the relief of sleep problems. However, clinical studies to evaluate the effectiveness and safety of herbs are scarce

## Other ways of therapy

- **Melatonin**
  - Melatonin is a hormone that is synthesized by the pineal gland (κωνοειδής αδέννας) in humans and produced in animals as well as plants. Although the effects of melatonin are complex and poorly understood, it plays a critical role in the regulation of sleep-wake cycle and other circadian rhythms.
  - Melatonin has been studied as a possible treatment of circadian rhythm disorders and may be helpful in decreasing sleep disturbances caused by jet lag. Adverse effects of melatonin are minimal, but long-term studies examining efficacy and toxicity of melatonin supplements are needed
- **Acupuncture**
  - often used in Traditional Chinese Medicine for the treatment of insomnia. This procedure involves the insertion of very fine needles (sometimes in combination with electrical stimulus or with heat produced by burning specific herbs) into the skin at specific acupuncture points in order to influence the functioning of the body. The results of recent preliminary clinical trials of acupuncture have indicated improvements in sleep quality in people with insomnia. However, additional research is required before the effectiveness of acupuncture is proved conclusively for the relief of insomnia

## Therapy

- ***Relaxation and Meditation***

- Increased muscle tension and intrusive thoughts interfere with sleep.
- It is not surprising that techniques aimed at relaxing muscles (progressive muscle relaxation and biofeedback) and quieting the mind (meditation) have been found to be effective treatments for insomnia.
- Most people can learn these techniques, but it usually takes several weeks before they can sufficiently master the techniques well enough to help ease insomnia.
- There is a growing body of evidence that supports the value of meditation in treating insomnia.
- Several studies show that regular meditation practice, either alone or as a part of Yoga practice, results in higher blood levels of melatonin, an important regulator of sleep.

## Χρήσιμες Συμβουλές

- Να κοιμάστε μόνο όταν νυστάζετε. Εάν δεν κοιμηθείτε μέσα σε 20 λεπτά, σηκωθείτε από το κρεβάτι, και απασχοληθείτε με κάτι «βαρετό» ώστε να νυστάξετε
- Αποφεύγετε να παίρνετε υπνάκους μικρής διάρκειας εκτός και αν σας τους προτείνει ο γιατρός
- Η διατήρηση ενός ισορροπημένου προγράμματος ύπνου είναι πολύ σημαντική. Προσπαθήστε να πηγαίνετε κάθε μέρα την ίδια ώρα για ύπνο, ακόμα και τα Σαββατοκύριακα
- Ήπιας μορφής άσκηση (πχ λίγο περπάτημα) βελτιώνει την ποιότητα του ύπνου αλλά καλό θα είναι να αποφεύγετε την άσκηση τουλάχιστον 4 ώρες πριν την ώρα που θα πάτε για ύπνο
- Βρείτε και εντάξτε στο πρόγραμμά σας ασχολίες που σας ευκολύνουν στο να κοιμηθείτε (π.χ να ακούσετε μουσική). Είναι σημαντικό να βοηθάτε τον οργανισμό σας να συνειδητοποιήσει ότι είναι ώρα για χαλάρωση και για ύπνο
- Χρησιμοποιήστε το κρεβάτι σας μόνο για να κοιμάστε και να ξεκουράζεστε. Αποφεύγετε να ξαπλώνετε στο κρεβάτι για να παρακολουθήσετε τηλεόραση ή για να τρώτε το κολατσιό σας
- Αποφεύγετε την κατανάλωση ροφημάτων, φαγητών και φαρμάκων που περιέχουν καφεΐνη, αλκοόλ και νικοτίνη τουλάχιστον 4-6 ώρες πριν τον ύπνο
- Κάντε ένα ζεστό μπάνιο 90 λεπτά πριν τον ύπνο. Το ζεστό μπάνιο ανεβάζει την θερμοκρασία του σώματος προσωρινά και η μείωση της θερμοκρασίας του σώματος που ακολουθεί θα βοηθήσει στο να νυστάξετε
- Βεβαιωθείτε ότι το δωμάτιο σας είναι ήσυχο και το κρεβάτι σας άνετο
- Χρησιμοποιείτε τις κατάλληλες κουρτίνες και οθοασπίδες εάν χρειάζεται. Ένα δροσερό δωμάτιο είναι απαραίτητο για ένα ποιοτικό ύπνο. Χρησιμοποιήστε συσκευές ρύθμισης της υγρασίας και της ποιότητας του αέρα εάν ο αέρας του δωματίου σας είναι πολύ ξηρός

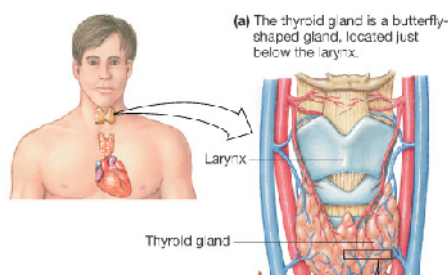
## Summary

- Sleep is essential for the body and the mind
- Sleep disorders affect quality of life and organ function
- Sleep deprivation affect cognitive and physical function
- Exercise training can improve sleep quality and quantity
- Herbs and relaxation techniques can be very helpful on the way of fighting sleep disorders

### ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

Μεταπτυχιακό πρόγραμμα “ ΑΣΚΗΣΗ ΚΑΙ ΥΓΕΙΑ”

## Μεταβολικές Ασθένειες & Άσκηση



**Τίτλος Διάλεξης:**

**Διαταραχές του Θυρεοειδή Αδένα και Σωματική Δραστηριότητα**

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## Outline

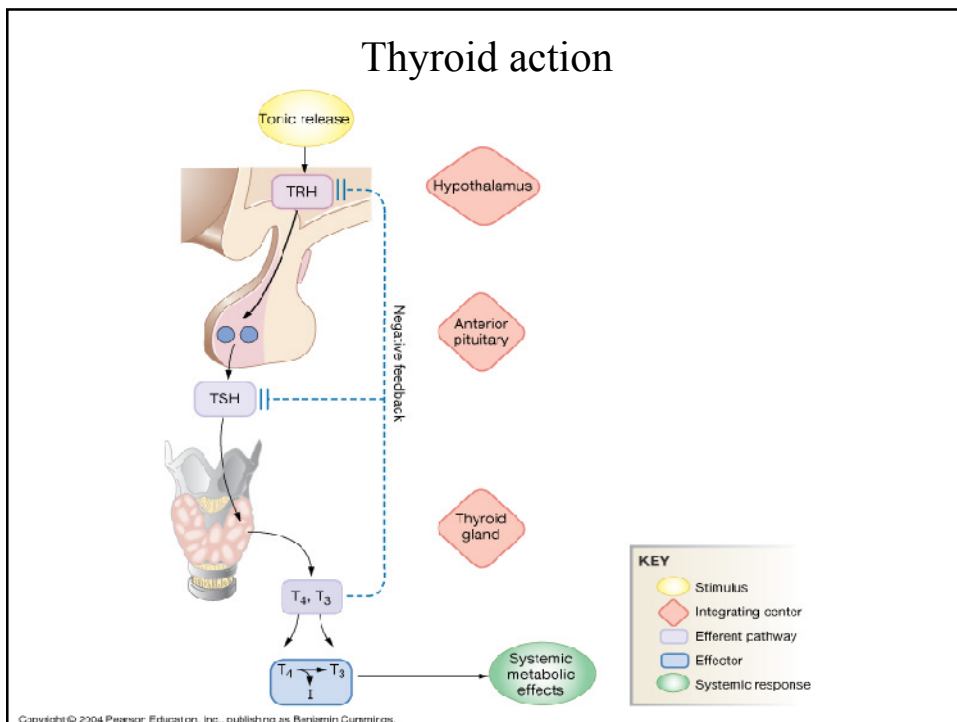
- Thyroid Gland – Basics
- Thyroid Diseases – in simple terms
- Thyroid Hormones effect skeletal and cardiac muscle
- Exercise Rehab Programs
- Making an exercise rehab program

## Thyroid Gland – Basics

- Butterfly-shaped gland lies just below the larynx
- Two distinct endocrine cells:
  - C cells secrete calcitonin (calcium regulating)
  - Follicle cells secrete thyroid hormone T3 & T4
- Thyroid hormones contain Iodine
  - 3 Iodine molecules for T3 and 4 Iodine molecules for the T4
- Is essential for the normal growth and development in children (myelin and synapse formation require T3 & T4 for neural growth)
- Control metabolism and regulates temperature, initiates transcription, translation and synthesis of new proteins
- Increase O<sub>2</sub> consumption in most tissue
- Interacts with other proteins to modulate lipids, carbohydrate and protein metabolism

## T3 & T4 production

- T3 called triiodothyronine (τριωδοθυρονίνη).
- T4 called thyroxin (θυροξίνη)
- TRH (thyroid releasing hormone-hypothalamus) → TSH (thyroid stimulating hormone-anterior pituitary – υπόφυσης ) → T3+T4 (thyroid) → T4 converts to T3 in tissues
- T3 is 5times more active than T4



## Thyroid Diseases – in simple terms

- Thyroid hormones are not essential for life but effect quality of life
- Most common disorders are:
  - Hyperthyroidism (hyper-secretion) – Grave’s Diseases
  - Hypothyroidism (hypo-secretion) - Hashimoto’s Disease
 Both conditions affect cardiopulmonary systems
- Hyperthyroidism:
  - Increased oxygen consumption at rest
  - increased free radicals and oxygen spices
  - Increased metabolic heat production at rest
  - Heat intolerance – produce a lot of heat
  - Increased protein catabolism – muscle weakness and weight loss
  - Hyper-excitability of the nervous system – increased reflexes, irritability, insomnia and psychosis
  - Increased heartbeat at rest and exercise
  - Increased force contraction of the heart muscle

## Thyroid Diseases – in simple terms

- Hypothyroidism:
  - Metabolic rate slows down
  - Oxygen consumption decreases
  - Cold intolerance – less internal heat
  - Decrease protein synthesis
  - Slower reflexes, speech and thought processes
  - Increased fatigability
  - Induced bradycardia (slow heartbeat)
  - Reduced mitochondrial function



## Examples



Exophthalmoses due to immune mediated enlargement of muscle and tissue in the eye socket



Goiter's disease due to excessive TSH stimulation

## Thyroid Hormones affect skeletal muscle

- Hyperthyroid (thyrotoxic) myopathies
  - Weakness, fatigue and thinning of muscles
  - Often in shoulder and arm muscles than in the lower limbs
  - Twitching and cramps are often
  - Reduced range of muscle contraction
  - symptoms remain for years after correction of hyperthyroid state
- Hypothyroid myopathy
  - Elevated CK activity
  - Delayed relaxation of reflexes
  - Muscle stiffness with cramps – exercise and cold aggravates them
  - The signs correlate with the duration of the hypothyroidism
  - Impaired catabolism of glycogen – mitochondrial function is reduced
  - Symptoms improve on the correction of the hypothyroid state



## Cardiac Muscle

- The heart is an organ sensitive to the action of thyroid hormone
- The increased metabolic state and oxygen consumption that occur in hyperthyroid patients require an increased supply of oxygen and removal of metabolic products from the periphery. This is accomplished by increasing the cardiac output to meet the needs of the periphery
- Thyroid hormones may significantly decrease the strength of respiratory and skeletal muscles and affect regulatory mechanisms of adaptation to incremental effort

## Summary

- T3, T4 and TSH are the most important indices for thyroid function
- Hyperthyroidism = increased T4
- Hypothyroidism = increased TSH and low level of T3 and T4
- Thyroid Hormones effect skeletal and cardiac muscle
- Exercise Rehab Programs have specific rules we have to follow