

ZRÍNYI MIKLÓS
NEMZETVÉDELMI EGYETEM
Hadtudományi Doktori Iskola

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**Sleep laboratory diagnostic methods in the verification of military
eligibility**

PhD thesis booklet

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Budapest

2008

The scientific problem

According to the summit meeting in Istanbul NATO must take more part in crisis reaction operations, so the member states have to provide greater sources to acquire such capabilities, which make the crisis reaction forces to be deployed in short times to distant crisis areas to execute a defined operation. This undertaken obligation in the Organization supposes that the units of the military forces should be organized, equipped and trained the way that they could start the operation in short time, if needed. The acquisition of this ability requires extreme financial and material standings and soldiers that have significant experience.

The development of the abilities, that are required to successfully fulfil a crisis reaction operation, the preparation and training needs that the participating soldiers are carefully selected, properly examined and supervised medically. The task of this latter can be to filter out the abnormalities (diseases), which might jeopardise the operation.

The significance of the sleep-wake disorders is known in the national and international military medicine. These diseases mean disability by the regulation of legal force of the Ministry of Defence. This question has become up-to-date, as the Hungarian Army has joined the NATO, and creates a conventional and voluntary army. Diseases belonging to sleep disorders are special; they usually remain hidden for a long time. Excessive daytime sleepiness can appear in the youth as well, it can be provoked in unusual physically and mentally strained situations, and might lead to fatal accidents and may result in worsening efficiency, and behavioral disorders even by night. Primer hypersomnias (sleep disorders) have great importance in the question of the eligibility, because they might appear by the time, when the volunteers apply for joining the military forces. On the other hand the best for the conventional and professional army is that its soldiers are being employed as long as possible. For this reason the detection of sleep disorders during service is also important.

In his PhD work¹ Zoltan Szakacs demonstrates the development of an efficient screening-system, which was established for treating the sleep-wake disorders that have high impact on the military service.

Sleep disorders are significant in the aspect of military medicine, because they can extremely and often suddenly restrain the mental and physical performance, they might cause disturbance during training, preparation and military operations. Knowing about them is important on behalf of prevention, definition and effective therapy.

The chronic daytime sleepiness and the concomitant attention deficit is a frequent complaint, which worsens significantly the work efficacy and life quality. In the background of the complaint of chronic daytime sleepiness, stands mostly the chronic sleep deprivation, which is the most common cause of the excessive sleepiness.

Ignoring the sleep deprivation phenomenon is the most common mistake of the military management, during military operations forces are often forced to sleep deprivation on behalf of the quick success of the task. The resulting fatigue and sleepiness might induce a lot of

¹ Szakács Zoltán: Hatékony szűrő-gondozó rendszer kiépítése a katonai szolgálatot jelentősen befolyásoló alvászavarok kezelése céljából. Doktori (PhD) értekezés 2006. Zrínyi Miklós Nemzetvédelmi Egyetem, Egyetemi Könyvtár.

mistake in the level of human decisions, which could be avoided by preventing sleep deprivation.

Military service in peace supporting missions primarily in the fields of security and transportation defines serious expectations for the soldiers on duty. Sleep deprivation endangers the appropriate accomplishment of the service. Extraordinary attention must be paid to diseases causing hypersomnia, their diagnosis can be obtained only in an efficient screening system.

The Sleep Laboratory of the Hungarian Military may get remarkable roles, as Hungary has joined the NATO, developing a professional force. Verification of the diseases is regulated by national and international protocols in the Hungarian Military Hospital.

Research hypotheses

The goals of my research work and the composition results of my research were motivated and ruled by the following research hypotheses:

1. Recognition of sleep-wake disorders that have great importance in the military medicine is very important, because the excessive daytime sleepiness that they can cause can notably impair the performance of the soldiers and may lead to fatal accidents or to disasters with heavy losses and damage. This might endanger the success of military operations. Sleep diseases that stand in the background of the symptoms of the major sleep disorders are probably unknown by the officers, the military doctors and the commandants, they usually confuse sleepiness with laziness.
2. Sleep disorders can appear in the youth as well, so that the volunteers are highly probable to be affected with. The difference between the civilian population and the soldiers in military service is presumably low in the distribution of sleep disorders.
3. Because of the above mentioned, during the health eligibility examinations of the volunteers and regular officers it would be probably efficacious to examine the soldiers in the question of sleep disorders, because there are no screening methods in use at present, although sleep disorders mean disability by the regulation of legal force of the Ministry of Defence.
4. The screening and the diagnosis of the sleep disorders require properly effective examination methods. This should be cost effective as far as possible, and contain objective instrumental supplements besides the subjective questionnaires, and so it can establish the diagnosis.

Goals of the research

In my study, I examined the population aged between 18-25 years, because this is the age group that rolls up for joining the military forces as volunteers.

In my research work I was looking for answers for the following questions:

1. How frequently occurs the excessive daytime sleepiness in the age group of 18-25 years that suits for the volunteer soldiers?
2. Which are the diseases that cause sleepiness in this age group?
3. How eligible are the questionnaires suggested by the international literature (Epworth sleepiness scale, Ullanlinna narcolepsy scale), and the sleep laboratory diagnostic instruments: the standard polysomnography and the multiple sleep latency test (MSLT) for the diagnostics of the diseases causing excessive daytime sleepiness?

Summary of the chapters

In the first chapter the relation of sleep wake disorders to military medicine is interpreted. I show the obligations that a soldier in the 21st century must fit according to the national and international literature, and how it is influenced by the excessive daytime sleepiness.

The second chapter is on diseases with excessive daytime sleepiness, which occurrence must be considered in the age group of 18-25 years. The symptoms and the diagnostic requirements defined by international protocols are also reviewed, and so are the diseases, which are the sleep disorders most commonly mixed up with.

In the third chapter the questionnaires and the instrumental sleep laboratory methods are shown, which I have used in my study for the diagnosis of the illnesses. The multiple sleep latency test is demonstrated in more detail, because its significance is extraordinary.

The fourth chapter presents the screening and sleep laboratory examinations of hypersomniás. This part shows the detailed results of the examinations made during the research work. First the results are presented according to the diseases, then the results are compared to each other and statistically analysed.

In the fifth chapter the results of the research work are taken with a soldier's eye, and compared to the results of the international military medicine. In a part of this chapter the role of the eligibility examinations are discussed.

Summarized conclusions

The problem of daytime sleepiness got into the focus of interest, as the claims raised to the 21st century soldiers are escalating. Specialists have already recognized the danger of sleepiness and its incompatible relation to the military service. Soldiers suffering from sleep disorders are more exposure to sleep deprivation

Symptoms and diagnostic protocols of hypersomnias that are present in the age groups of the volunteers and are relevant in military eligibility is known. All of these diseases appear with heavy daytime sleepiness, but they can be identified only with appropriate diagnostic instruments in a properly equipped sleep laboratory, and only by a sleep medicine specialist.

Based on the results found in the scientific literature, the occurrence of sleep disorders in the military and civilian population is almost the same. If we take a look at the results of the patients observed in the Sleep Laboratory of the Hungarian Military Hospital, a prevalence of the disorders can be seen related to certain age groups of the soldiers. Eligibility examinations made in the Hungarian Military yet do not contain screening methods for sleep disorders, although sleep disorders mean disability by the regulation of legal force of the Ministry of Defence

According to my goals, my research contained the study of the sleep laboratory diagnostic instrument system, which permits the quick and proper diagnosis of sleep disorders with hypersomnia occurring in the age group of 18-25 years.

In my research the examination methods interpreted in the chapter named „*A kutatómunka során alkalmazott alvászlaboratóriumi diagnosztikai módszerek bemutatása*” were applied. These were the Epworth sleepiness scale, the Ullanlinna narcolepsy scale, the sleep log, and from the instrumental examinations the standard polisomnography (PSG), the multiple sleep latency test (MSLT) and the actigraphy. My choice is reasoned by the results in the international literature, and by the protocols found in the publications of the International Classification of Sleep Disorders (ICSD) and in the Hungarian Sleep Society.

My goals were achieved by the followings:

1. In my research I have analysed epidemiologically the sleep disorders with excessive daytime sleepiness of the 18-25 years old (fitting to the age group of volunteers to military service) Hungarian civilian population. I set out, that from the 274 patients of the age group, that appeared in the sleep laboratory, 97 patients, 35,4% had excessive daytime sleepiness according to the Epworth sleepiness scale. In the background of hypersomnia narcolepsy, upper airway resistance syndrome, idiopathic hypersomnia and circadian sleep-wake disorder could be obtained.

2. The Ullanlinna narcolepsy scale had reliably screened the narcoleptic patients in my research. According to my study, the specificity is 87,75%, and the sensitivity is 93,75% of the Ullanlinna narcolepsy scale based on the examinations of the Hungarian patients.

3. Polisomnographic study has a great importance in the diagnosis of the diseases. PSG shows the abnormalities of the sleep structure, and so values like sleep fragmentation (micro-awakenings and sleep study shifts), proportion of slow wave sleep (which is responsible for restoration), or the night's sleep latency can be measured objectively. These data were statistically analysed and I found significant differences between the results of the different patient groups. Beyond sleep structure, breath pathology events become visible as well. In case of UARS, recognition of these events has a diagnostic value.

I paid special attention to the evaluation of the MSLT examination, because this test has a great significance in the differential diagnoses of the disorders.

Based on my experiences I set out, that besides the proper evaluation of the history and the clinical symptoms, MSLT is essential in the diagnosis of sleep disorders with excessive daytime sleepiness. Adherence to the strict criteria of ICD-10 and the national protocols is elemental. It is outstandingly important, that MSLT can be evaluated exclusively with the polysomnographic study of the previous night. Testing five times per day is necessary for the reliability of the multiple sleep latency test. Completing the basic montage (with supra- and infraorbital and occipital electrodes) is less important in this regard.

4. Summarizing the results of my examinations I set out, that using the sleep laboratory examination methods I applied is established in the diagnosis of the diseases with excessive daytime sleepiness and in the screening the potential patients.

New scientific results

With my research work I have reached the goals of my study. I have proved with the methods I used that my hypotheses were established and led me to reach my aims.

Summarizing my research work for my PhD thesis, the new scientific results are the followings:

1. I was the first to analyse epidemiologically the sleep disorders with excessive daytime sleepiness of the 18-25 years old (fitting to the age group of volunteers to military service) Hungarian civilian population. I set out, that from the 274 patients of the age group that appeared in the sleep laboratory, 97 patients, 35,4% had excessive daytime sleepiness according to the Epworth sleepiness scale, which means high accident risk, detains mental development and performance, puts socially at a disadvantage.
2. I was the first to analyse, which are those sleeping disorders with excessive daytime sleepiness that the age group above is concerned with. In the background of hypersomnia narcolepsy, upper airway resistance syndrome, idiopathic hypersomnia and circadian sleep-wake disorder could be obtained. Narcolepsy was present in 50%, upper airway resistance syndrome in 48%, idiopathic hypersomnia and circadian sleep-wake disorder in 1% of the patients. These are the illnesses, which symptoms are prominently important to be recognized during the eligibility examinations, and the officers' attention also must be attracted to them
3. Summarizing the results of my examinations I set out, that using the sleep laboratory examination methods I applied: the questionnaires (Epworth sleepiness scale, Ullanlinna narcolepsy scale) and the sleep laboratory diagnostic instruments: the standard polysomnography and the multiple sleep latency test (MSLT) is established in the diagnosis of the diseases with excessive daytime sleepiness and in the screening the potential patients, because of their sufficient sensitivity.
4. According to the fact, that the verification of the sleep disorders with excessive daytime sleepiness mean disability in the military service, using the applied questionnaires (Epworth sleepiness scale, Ullanlinna narcolepsy scale) and the sleep laboratory diagnostic instruments: the standard polysomnography and the multiple sleep latency test (MSLT) observing the rules of the national and international protocols can provide indirectly important and yet missing data for the verification of military eligibility.

Practical usability of the work, suggestions

Based on my PhD thesis, my suggestions are the followings for the Hungarian Army:

- I suggest that the trainer officers and commandants should be educated with the sleep disorders, so that they could recognize the problem, and they could direct their underlings to sleep laboratory testing. In my opinion, besides the special medical examination of the contractual soldiers, we must pay attention for the education of the officers and commandants on behalf of recognizing the symptoms of the disease.
- I suggest that the eligibility examinations of the joining voluntary soldiers should be completed. On the first level, excessive daytime sleepiness should be screened by questionnaires, and depending upon their results soldiers could be further analysed by sleep laboratory instrumental examinations.
- Hungary has committed itself to sending 300 men for every exchange to the NATO Crisis Reaction Force. I suggest that in the case of these soldiers the questionnaire screening should be completed by all means with a polisomnographic study.

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Curriculum Vitae

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