

NATIONAL UNIVERSITY  
OF PUBLIC SERVICE  
Doctors Council

## **AUTHOR'S GUIDE**

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*Possibilities of using the magnetotherapy for amend quality of life  
among professional soldiers of Hungarian Military*

authors guide of the entitled PhD dissertation

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Budapest  
2014.

## INTRODUCTION OF THE SCIENTIFIC PROBLEM

The satisfactory and relative levels of the 'sustainable health' of soldiers can remain until the late period of their lives, and they must proactively pursue to make the quality service as long as possible. The Hungarian Defence Combined Forces' Declarations also defines the preservice of the combat capability as a force protection task, so that the soldier must be healthy, war allowed and applicable in given times and places.

The constant stress, the preparedness, the forced compliance, the practices and missions affect primarily the professional soldier's quality of life and life expectancy in a negative way. However, according to the recently changed legal regulations the age tree of defence forces is shifting towards higher age groups. It is precisely that age group that remains (goes back to) in the system of professional staff that is the most affected by certain public health problems (such as disease of the cardio-circulatory system).

The termination of the pre- age limit pension, which followed 25 years of service, the extension of the service time predicts that in a few years the significant portion of the staff near the 65-year upper age limit will have to face such health, mental and physical challenges, that may hinder their work and service capability in addition to the appearance of diseases on individual levels.

According to the results of the most recent (2012) survey involving nearly 6000 professional soldiers the diseases of the circulation system take the first place among the treatments.

We can see similar problems (smoking, poor diet, sedentary lifestyle) within the staff of the HDF as the civil society, and statistical data shows that the incidence of certain diseases is similar. All this makes the need intensified for health-promotion and prevention programs on all levels among the civil society as well as in the professional staff of the HDF.

## AIM OF THE STUDY

The modern military-treatment faces a challenge solving the situation.

The statistical analysis of the data shows that the diseases of the circulatory system are an emphasized problem among the society, as well as in the army. The professional staff is becoming more and more qualified and represents more value, which is needed to be protected and preserved. The aim would be the best possible use of the financial resources. The change in medical community, which is becoming more and more accepting, even supporting towards alternative and complementary medical therapies, leaves room for the applicability of these solutions. However, the introduction of everyday use requires a potentially suitable therapy, such as the magnetic therapy, which I prefer. We justify its effectiveness with scientifically methods, just like in the case of any other evidence based medicine.

The aim of my research was to justify the effectiveness and safety of a treatment method (already proven among other disease groups) in a new indication (the treatment of the specific diseases of the circulatory system), according to methods required and advised by the MTA.

Since cardiovascular diseases are the main cause of death among the professional staff worldwide, improvement in the quality of life can be rightly expected from the application of the method.

### Hypotheses:

1. The Ku70 gene, which plays a primary role in the reparation of the DNA-fractures, is not expressed by the electromagnetic field used during the treatments, so I am able to prove indirectly that the treatment does not damage the DNA.
2. As the result of magnetic treatments with given dosimetry a decrease in the blood pressure can be observed. The treatment is an effective tool in the treatment of this disease.
3. The magnetic field therapy is effective in improving the circulation of the lower limbs.
4. As the chronic result of the magnetic field therapy an improvement in the arterial stiffness can be observed, thus lowering the risk of developing serious diseases (heart attack, stroke) later on.

## METHODS

### *The methods of selection of the literature*

I wanted to review the results of scientific achievements of the past decades, in particular the latest results of the 2-3 past years. I considered the studies done by already adopted medical methods a priority.

#### The criteria of selection of the literature

- whether the presented results will be statistically verifiable
- whether source contains information about the justifiable appropriateness in medical terms
- whether the article is scientifically classified as appropriate

### *Clinical research*

Justify my hypothesis' I conducted the clinical study no. 76-1-6/2012 authorized by the OGYI and The Regional Medical Ethical Committee of Petz Aladár Hospital, Győr.

The full sample (n=54) was selected within pre-screen work based on the data at rest of the circulatory system. The tests were conducted among men and women between the ages of 45 and 65 (active and retired professional soldiers). We randomly selected (n=14) people from the full sample who made up the control group. Furthermore, we selected (n=13) people from whom we brought muscle samples by fine needle biopsy method to perform gene expression studies on them.

The people involved in the study were selected from patients attending outpatient care with age-appropriate health levels. Age and age appropriate health levels were also criteria. The certification was performed by an internal medicine and cardiology specialist in all cases. Exclusion criteria were any health problems included in the contradictions, as well as any drastic change in lifestyle or medication during the research.

During the estimation of the sample size, the following criteria were kept in mind. There must be enough patients involved in the study to make the later result and the conclusions drawn from it established, however – under the given conditions – the number of patients involved should be low as low as possible to not treat graciously many of them with placebo.

Naturally, the most important criteria was that the expected statistically significant difference to be also clinically relevant.

During the intervention we applied 10-week treatment after the determination of the start-up status, using 'Impulser Pro' class full-body treatment compatible magnetic bed. Treatments occurred 5 times in a week for 15 minutes.

Characteristics of the used signal: the base is one (exponentially) modulated sine wave, the upper and lower envelope are both a quadratic equation, asymmetric waveform, the signal packet length is 20ms, and the interval between the packets is 10ms.

Of non-invasively measurable parameters rating the current state of the vascular system we recorded the systolic and diastolic blood pressure in clinical studies, and we used the results to calculate the pulse pressure and estimate the ASI (arterial stiffness index) with a CardioVision MS 2000 oscillometric device.

To estimate the change in the peripheral circulation we continuously recorded the jacket temperature with YSI400 thermistors. All treatments occurred in climated rooms with the temperature set on 22 C at all times.

We took muscular biopsy sample (from striated muscle) from 13 volunteers 30 minutes before and after the treatment. The sample was immediately frozen in liquid nitrogen and stored at -80 degrees Celsius. We ionized RNS using Nucleospin® RNA/Protein kit according to the manufacturer's instructions (Macerey-Nagel, Düren, Germany). The concentration, purity and integrity of the RNS (RIN) was measured with Bioanalyzer (Agilent Technologies, USA), and the sample was stored at -70 degrees Celsius. We synthesized cDNA with cDNA Synthesis kit (Bioline, Luckenwalde, Germany) according to the manufacturer's instructions, and then we determined the mRNS levels of the proteins with qRT-PCR.

I evaluated every patient's physical parameters with standard descriptive statistics. I evaluated the chronic change of the physiological parameters with ANOVA (Analysis of Variance with repeated measures) using treatment - time (before, after) relation.

I used dependent t-test to evaluate acute effects, and Pearson Correlation Test to evaluate the change of gene expressions. The significance levels were set at  $p < 0.05$  at all times. Statistica for Windows ver.11. legitimate program was used for statistical analysis and calculations.

## RESULTS

The initial results of the treated and the placebo group did not differ significantly neither in systolic and diastolic blood pressure, nor in pulse pressure, so the effect of the treatment is appreciable and can be justified based on the measured data.

The average initial blood pressure of the treated group was 145/75 Hgmm, while the average initial blood pressure of the placebo group was 146/75 Hgmm. Based on initial blood pressure, members of both the intervention and control group belong in the lightly affected category.

The initial results of the average pulse pressure: 69 Hgmm in the intervention group, 70 Hgmm in the placebo group. The difference is not significant, results of both groups belong in the affected category.

As the effect of the treatment the systolic pressure of the participants significantly reduced, while significant changes in the support group could not be observed. The deviations near the averages measures 10 weeks before and after the treatment are not significant. As for the change of the systolic pressure in the intervention and placebo group, the difference of the averages are real.

The difference of the systolic and diastolic pulse pressure, which is the constant pressure of the big arteries named pulse pressure, the difference is significant. The decline keeps the pulse pressure just under the significance level ( $P=0.05$ , 60 Hgmm). Comparison of the average pulse pressure with the control group's results shows significant difference.

As to the difference of the peripheral jacket temperature, it is significant. The difference is significant ( $1.48\text{ }^{\circ}\text{C}$ ). The placebo group's the peripheral temperature increased, but it is negligible.

The initial ASI data of the treated and the placebo group did not differ significantly, it was 79 in the treated, and 83 in the placebo group. The difference of the ASI data measured before and after the treatment is not significant, however, numerically it is. The fact cannot be neglected that before-treatment ASI is nearly 10% above the eligibility limit of 70, while after the treatment it is 10% under that. Comparing the results of the treated and the control group we can also see that the difference is not significant, only numerically.

Subunit of the protein taking part in repairing DNA fractions (Ku70+Ku80 heterodimer). From taken tissue samples (13) 6 were useful, but this is enough for the statistical analysis. The difference (reduction) is not significant between the two groups (before and after).

## SUMMARY OF CONCLUSIONS

The systolic pressure of the participants reduced significantly. Participants can be put into the lightly affected category according to their initial blood pressure, while after reduction (11,11 Hgmm) we measured blood pressure results appropriate for their age. Nearly 15 units of artery elasticity index can be observed. After the treatment the measured were under the significance limit. The  $\sim 1,5$  °C increase of the peripheral jacket temperature proves that a significantly bigger amount of blood flows on to the peripheries.

It is not debatable that the systolic, diastolic blood pressure and the pulse pressure calculated from the difference of these approaching the physiologic territory indicate positive change in the health status. It can be demonstrated that the systolic blood pressure, the reduction of the pulse pressure and the decrease from the baseline of the arteries' elasticity can be considered as the reaction of the aorta and the large blood vessels to mechanical effects. Thus, the same amount of blood ejected will reach the periphery in better performance, because its boiler function functioning near the optimal physiological levels facilitates this.

As for the physiological reactions indicated by the increase of the temperature, it launches a series of certain answers on the level of the central nervous system in the hypothalamus, together with the synchronized activity of the thermo-receptors found in the skin and internal organs. At the initial phase of the EMF exposition the body temperature increases, then stabilizes. At this early phase the amount of transmitted blood increases, which modifies the amount of liquid in the extracellular area. Furthermore, the transportation of the greater amount of blood increases the heart frequency and the intraventricular blood pressure. This is cardio-dynamic heat loss, which can cause adaptation if repeated regularly. The certain aim of the answers are to hold the homeostasis, which significantly mobilizes the operation of the neuroendocrine system. The increase in the amount of blood reaching the periphery and the change of the temperature of the studied points determines the course of the biochemical

reactions present in every assembly. The final result of these biochemical changes is the change of the blood's colloid state, which is regulated by the trombineplasm system. The trombineplasm system's physiological role is to optimise the oxygen-transportation's average speed and the amount of oxygen used.

## NEW SCIENTIFICAL RESULTS

### 1. scientifical result

I proved that the treatment is safety, it does not cause damage in the DNA (in the short run).

### 2. scientifical result

I was the first in Hungary to examine and prove that the correctly used magnetic field therapy is an effective tool of reducing the blood pressure with randomized double-blind clinical research.

### 3. scientifical result

I was the first in Hungary to prove that the applied treatment is a tool of improving the peripheral circulation.

### 4. scientifical result

With my measurements I proved that following the correctly applied magnetic field treatment, the ASI decreased below the significance level.

## PRACTICAL USE OF THE RESEARCH RESULTS

The results of the clinical research confirm that the treatment done by the magnetic field device:

- decreases the blood pressure
- improves the stiffness of the great blood vessels
- improves the peripheral circulation
- does not have an acute DNA-damaging effect

The correctly applied magnetic field therapy can be an efficient and safety method of treatment of the most significant cardiovascular problems and avoiding later complications among the professional staff of the Hungarian Army.



With 15 minute daily use of the therapy, which also can be applied in the passive time (while sleeping, resting), significant (11 Hgmm) average decrease in blood pressure is available. Through this we can decrease the most frequent diseases of the heart and the circulatory system among the staff.

## RECOMMENDATIONS

Based on the results the correctly applied magnetic field therapy is an effective, cost-effective and safe tool of treating certain diseases of the circulatory system. This is why I recommend the application of the device among the professional staff of the Hungarian Army on a daily basis.

The fact cannot be overlooked that the simplicity of the treatment means that it does not require active participation from the unit, with the correct formation of the bunks it can be used during the sleeping time (which cannot be used for anything else anyway).

Further research should impact the acute hypotensive effect of the therapy, and the practicality of the acute effects.

Also should not be overlooked that a significant number of catastrophes caused by the dysfunction of the circulatory system occur in early hours. Presumably the automatized use of the device in the early hours may decrease the number of these catastrophes or even avoid them. This requires further researches of course.

I recommend the examination of the long-term effects with longitudinal cross-sectional studies, which may confirm (or even confute) the safety of the therapy.

The results presented in the dissertation and literature on the subject confirms that the magnetic field treatment improves the state of the circulatory system and intensifies the circulation. This, by itself, can mean that the 'oxygen-debt' after the load can be settled sooner, and the accumulated waste products leave sooner.

Based on the results of my study I suggest the scientific investigation of this area as soon as possible.

## MY PUBLICATIONS LINKED TO THIS STUDY

**János Rikk**, Kevin J. Finn, Imre Liziczai, Zsolt Radák, Zoltán Bori, Ferenc Ihász:  
Influence Of Pulsing Electromagnetic Field Therapy On Resting Blood Pressure In Aging Adults

*Electromagnetic Biology And Medicine* Informa Health care Journal ISSN: 1536-8378 (print), 1536-8386 (electronic) 2013/2, DOI: 10.3109/15368378.2013.776420

**János Rikk**, Ferenc Ihász:  
Middle-aged people's body composition and cardio-vascular indicators  
2<sup>nd</sup> International Christmas Post-graduate School 2007., Szombathely

**János Rikk**, Ferenc Ihász:  
Analysis of characteristics of cardiovascular system and body composition by middle-aged men  
3<sup>rd</sup> International Christmas Post-graduate School 2008., Szombathely

**János Rikk**, Ferenc Ihász:  
Body composition and cardio-vascular indicators of middle-aged females and males  
ICSS 2008., Budapest

**Rikk János**; Ihász Ferenc:  
Pocak nélkül nem élet az élet - Magyar nők és férfiak néhány testösszetételi mutatójának összehasonlítása  
Apáczai napok Nemzetközi Tudományos Konferencia 2009., NYME AK, Győr

**Rikk János**, Konczos Csaba, Ihász Ferenc:  
A testösszetétel életkorfüggő változásai a gyermekkortól az agykorig  
MET X. 2009., Budapest

Ihász Ferenc, **Rikk János**:  
Közép- és áthajló korú férfiak testösszetétel jellemzői és azok hatása a kardiovaszkuláris rendszerre  
VII. Országos Sporttudományi kongresszus, 2009. május 27-29., *Magyar Sporttudományi Szemle* 2009/2. p.31.

Ihász Ferenc, Szakály Zsolt, Király Tibor, Konczos Csaba, **Rikk János**:  
Magyar és külföldi labdarúgók testösszetételi és kardiovaszkuláris jellemzőinek bemutatása  
Nemzetközi Sporttudományi Konferencia 2010. október 28-29., Pécs, *Magyar Sporttudományi Szemle* 2010/3. p.26. (I. díj)

Ihász Ferenc, **Rikk János**:  
A kardio-respiratórikus rendszer jellemzői gyermekkorban  
Népegészségügyi Képző- és Kutatóhelyek Országos Egyesületének V. Konferenciája – Szeged, 2011.

**János Rikk**, Ferenc Ihász:  
Analysis of the body composition effects on characteristics cardiovascular function among the middleaged males  
EAS 80<sup>th</sup> Congress – *Milan*, May 25-28, 2012.

**Rikk János**, Liziczai Imre, Radák Zsolt, Ihász Ferenc:

Az „Impulser” bioelektromos mágnessterápia hatása a keringési rendszerre, a zsír-és cukoranyagcserére

Népegészségügyi Képző- és Kutatóhelyek Országos Egyesületének VI. Konferenciája – Budapest, 2012. szeptember 5-7.

**János Rikk**, Kevin J. Finn, Imre Liziczai, Zsolt Radák, Zoltán Bori, Ferenc Ihász:

Influence of Pulsing Electromagnetic field on circulatory system, lipid- and glucose metabolism

7<sup>th</sup> International Workshop on Biological Effects of Electromagnetic Fields – Malta, 8-12. October 2012.

**János Rikk**, Sándor Sandra:

Influence of PEMF Therapy on Gene Expression in Muscle Cells, Peripheral Circulation, and Metabolic Factors In Aging Overweight

BioEM 2013., Thessaloniki, 10-15. June 2013.

**Rikk János**, Kóródi Gyula:

A mágnessterápia alkalmazása a Magyar Honvédség hivatásos állománya körében leggyakoribbnak tekinthető betegség - a magasvérnyomás - kezelésére.

*Társadalom és honvédelem* 2013/3-4. , p.488-501. (ISSN: 1417-7293)

Ihász Ferenc, **Rikk János**: *Egészségfejlesztés*; Győr, 2010. (ISBN 978-963-08-0254-3)

**Rikk János**: Komplementer medicinák in Ihász Ferenc: *Egészségmegőrzés, Prevenció, Terhelésélettani alapismeretek*; Győr, 2013. (ISBN 978-963-08-5981-3)

Sandra Sándor, **Rikk János**: *Impulser terápia*; Budapest, 2013. (ISBN 978-963-08-5747-5)

**Rikk János**: ; *Kutatásmódszertan*; Budapest, 2014. (ISBN 978-963-08-9495-1)

# CURRICULUM VITAE

## PERSONAL DETAILS

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Surname: RIKK  
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## EDUCATION

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1987–1992. **ELTE ÁITFK** Budapest  
*Teacher of Mathematics, Physics and Computer Studies*

- IV. place of *Nationwide Academic Competition* in 1990.

2006–2009. **NYME ACsJK** Győr  
*Recreation and Health Improvement Manager BSc.*

- 2007. *2<sup>nd</sup> International Christmas Post-graduate School* presentation  
 Middle-aged people's body composition and cardio-vascular indicators.
- 2008. *Nationwide Academic Competition* I. place  
 Middle-aged people's body composition and cardio-vascular indicators.
- 2008. *The XVIII. International Conference on Sport Sciences for Students* Special Award  
 Body composition and cardio-vascular indicators of middle-aged females and males
- 2008. *3<sup>rd</sup> International Christmas Post-graduate School* presentation  
 Analysis of characteristics of cardiovascular system and body composition by middle-aged men
- 2009. „Apáczai” Medallion Silver Degree

2009–2010. **ELTE PPK** Budapest  
*Teacher of Informatics MSc.*

2010. **NYME ACsJK** Győr  
*„Applied Exercise Physiology” Intensive English Workshop*

2013. **NKE Faculty of Military Engineering** Budapest  
*PhD degree candidate*

## LANGUAGES

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ENGLISH intermediate (B2) complex

- ELTE ITK ORIGO

GERMAN intermediate (B2) written and oral

- ELTE ITK ORIGO

## FELLOWSHIP

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2007.	<b>MET</b> Hungarian Society on Obesity Studies
2009.	<b>NKE</b> Society of Education and Reserch on Public Health
2009.	<b>EUPHA</b> European Public Health Association
2011.	<b>EAS</b> European Atherosclerosis Society
2012.	<b>BEMS</b> Bioelectromagnetic Society
2012.	<b>EBEA</b> European Bioelectromagnetic Association

## WORK EXPERIENCE/RESEARCH ACTIVITY

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2005–2007	<b>Effects of physical activity in elderly people</b>
2006–2009.	<b>Health screening observations</b>
2007–2008.	<b>Middle-aged people's body composition and cardio-vascular indicators</b>
2008–2009.	<b>Effects of physical activity with ball on body composition and cardio-vascular indicators</b>
2010.	<b>Comparison of hungarian and foreign soccer players</b>
2010-2011.	<b>Effects of Sonotherapeutic treatment on cardio-vascular system</b>
2011–	<b>Clinical study of „PEMF” magnetotherapic appliance</b>

Budapest; 30 November 2014

RIKK János

