There are no incurable diseases - only incurable people who lack wisdom to understand the laws of nature and the will of the self-discipline to take advantage of all the benefits of natural forces *Kenneth Jeffrey*

Gheotermal water for human health promotion

Dr. Lolita Rapolienė, Prof. Geriuldas Žiliukas, Prof. Arvydas Martinkėnas
Klaipėda Seamen health care center
Klaipėda University

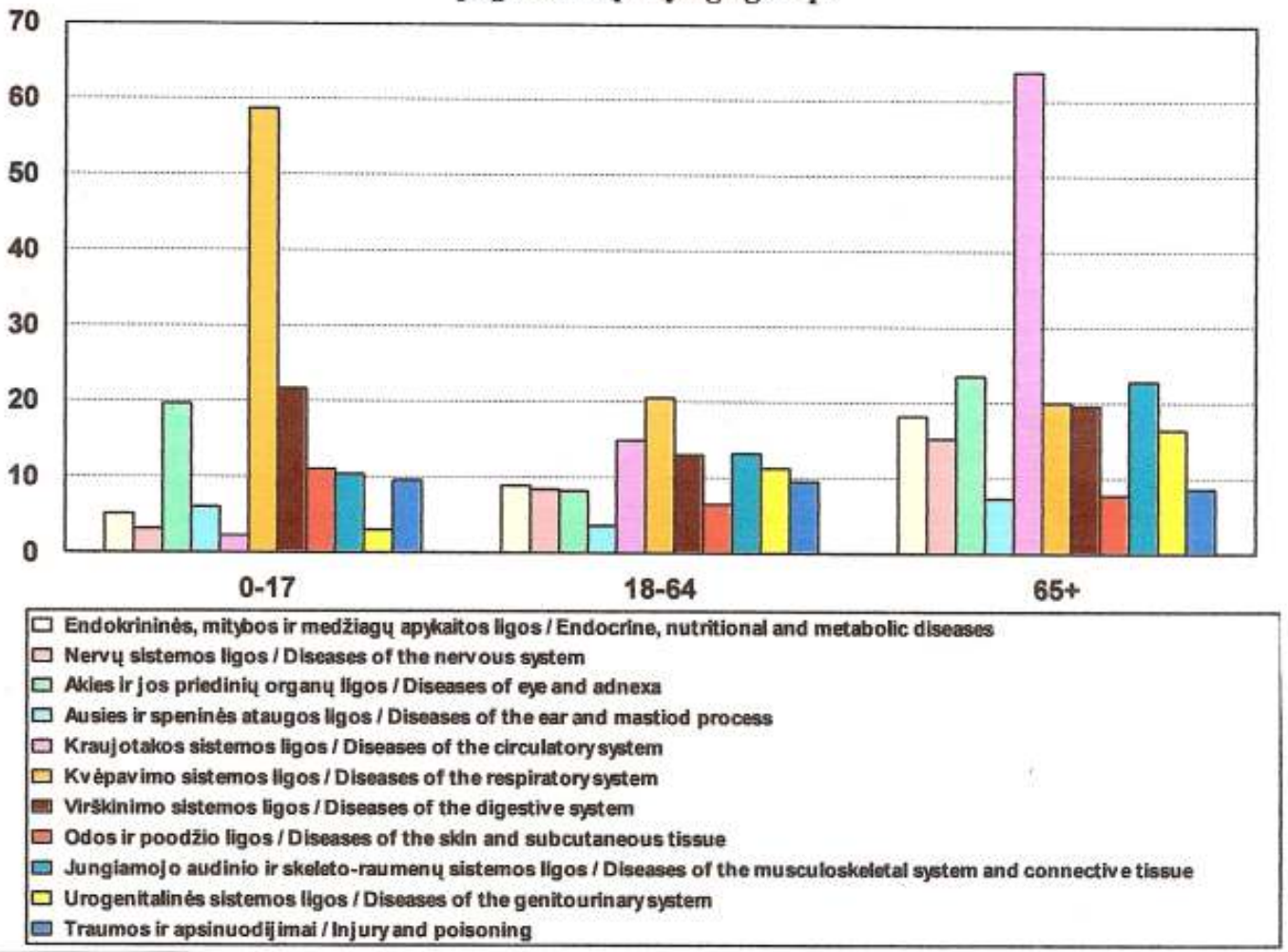
Health- Holistic and integral approach

- **WHO definition of Health**
- Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. 1948

Sergančių asmenų skaičius pagal ligų grupes 2011 m. 100 gyventojų (ligos ir traumos, užregistruotos sveikatos priežiūros įstaigose)

Number of Ill Persons by Groups of Diseases in 2011per 100 pop. (diseases or traumas registered in health care institutions)

pagal amžių / by age groups



Balneotherapy

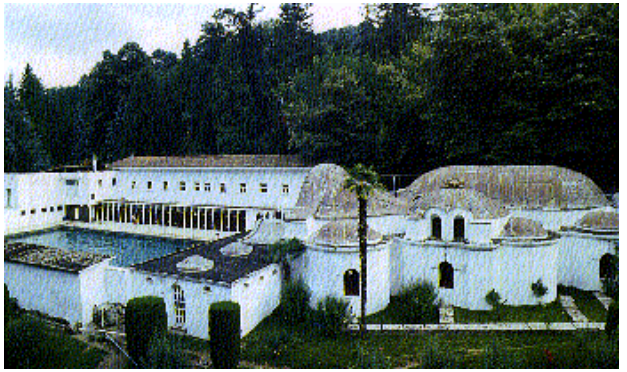
- **the therapeutic use of balneological agents**

(mineral and thermal waters, muds and gases);

- usually through water or gas (not so often) immersion of part or all of the body,
- through mud applications (total or local baths or packs or even tampons),
- through drinking mineral and thermal water,
- through inhaling the vaporized or dispersed mineral and thermal water

History of balneotherapy

- Asian archeological findings show that the mineral water bathing has been used already in Bronze Age, 5000 years ago.
- Dogo Onsen exceeding 3000 years in Japan.
- The use of spring and thermal water for health also dates back to ancient times in the main land of Turkey i.e. Anatolia (Asia Minor).
- There are remains of bath in Palace of Knossos, Greece (1700 pr.me), bathing exists in legends (the goddess Artemis, with nymphs, Hercules with the Centaurs)



Mechanism of action of mineral baths

- **Combination of mechanical, thermal and chemical effects**
- Environmental change
- A non-competitive atmosphere
- Absence of work duties

Psychological effect

“Hot Water Immersion” in Balneotherapy and Hydrotherapy

Factors	Effects
Temperature	Thermal effects; analgesic, muscle relaxation, peripheric vasodilation, anti-inflammatory, release of β endorphin
Hydrostatic Pressure	Cardiovascular and urinary effects; central blood redistribution, ANF secretion, diuresis
Buoyancy	Mechanical relaxation, join mobility; ability to float, easily lying position
Viscosity	Resistance of motion through water (during walking and exercising)

Specific Chemical Ingredients

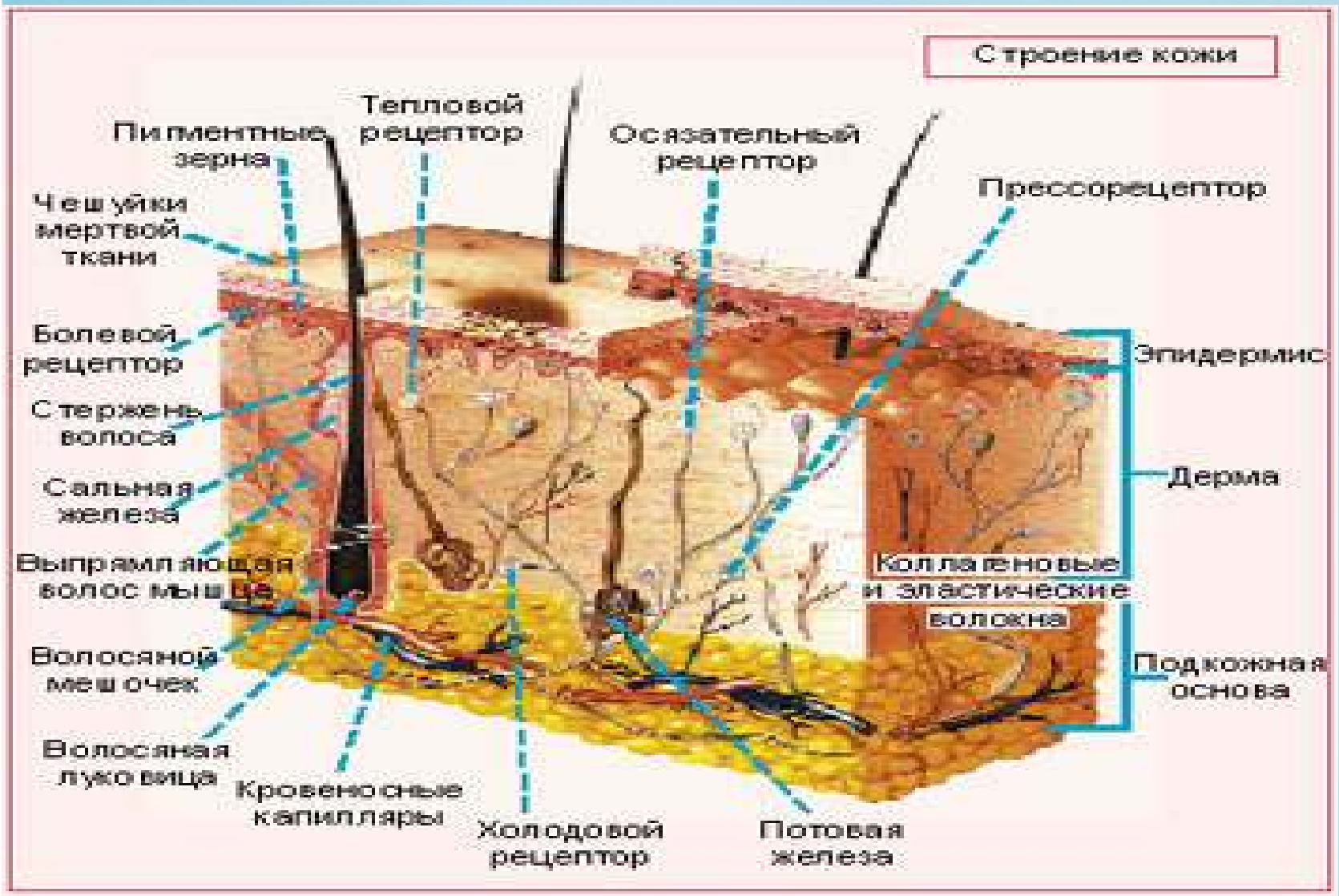
min 1g/l total mineralization, min mineral concentration (Na, Br, F, I, S, K, Mg, Fe,etc), gases (CO2, H2S,etc)

Chemical Ingredient	*Minimum concentration*
Sulfur (S^{2-})	1mg/L
CO_2	500 or 1000mg/L
Radon (^{222}Rn)	666Bq/L (α-particle)
Salt (NaCl)	1g/L (Salty), 14g/L (Brine)
Na^+	500mg/L
Cl^-	800g/L

Mineral composition	Causes biologic effects: immunomodulatory, peripheral vasodilatation, realise of beta endorphins, anti-inflammatory, anti-algic
Mechanisms	Not **completely** understood
Probably Involved	***"NICE"*** systems; ***N***euro-***I***mmuno-***C***utaneous-***E***ndocrine

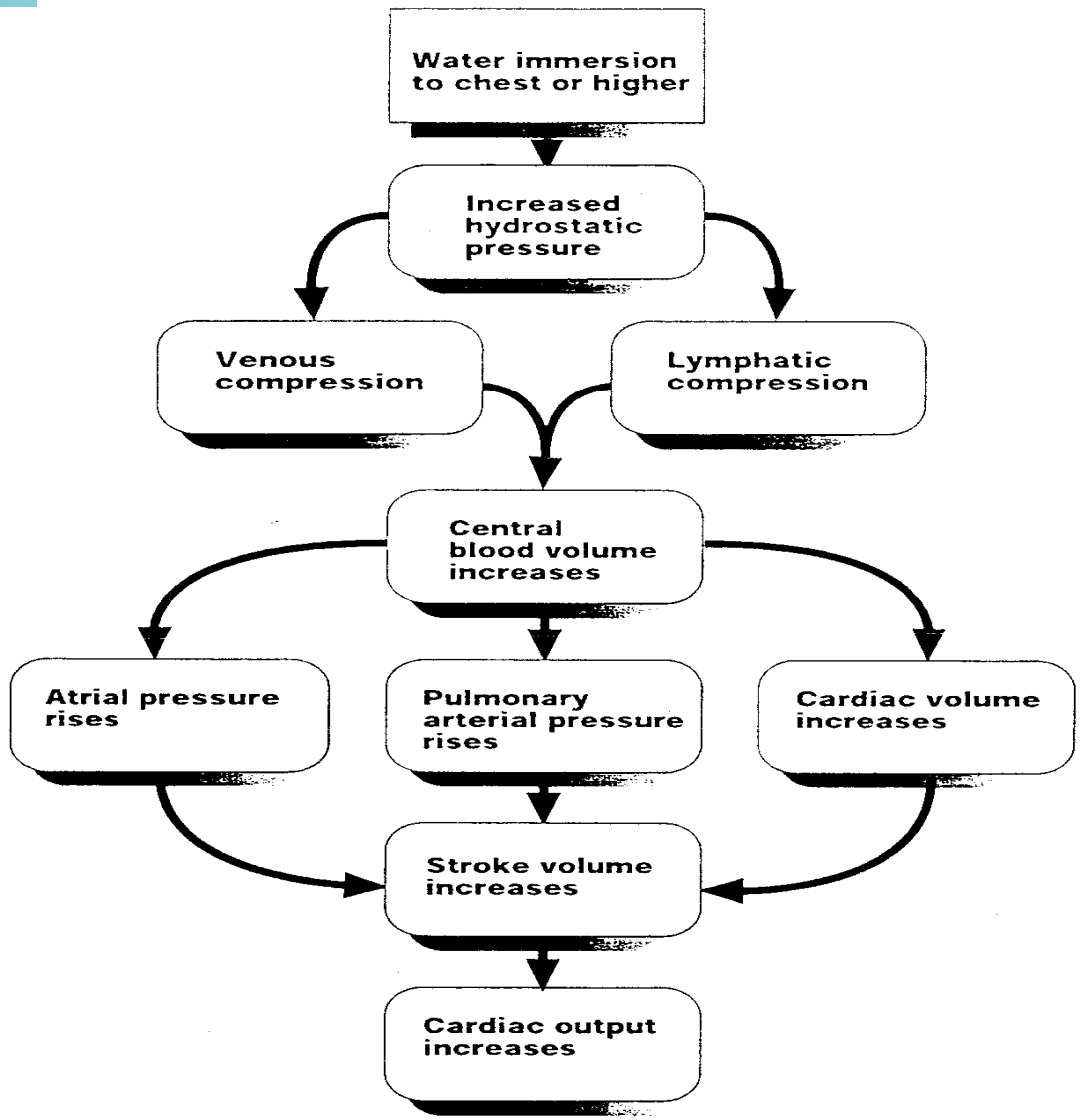
Effects of minerals on the organism

- Na: strengthens the system of metabolism; reduces symptoms of arthritis;
- K: soothes and has anti-allergenic properties; normalize heart rhythm, helps reduce blood pressure, helping to eliminate toxins, improves skin condition; K+Mg+Ca: strengthens the water balance of the body causing stimulation of the kidneys.
- Ca: Relieves swelling and strengthens bones.
- Mg: strengthens the protection of the organism, preventing atherosclerosis, reducing the concentration of cholesterol in the vessel wall; helps in maintaining normal heart rhythm, converting blood sugar into energy, maintains muscle tissue and hormone levels;
- Si strengthens the bones, immune system, restore the nerves, mucous membranes, hair, nails, a positive effect in treating acne and migraine;
- Cl benefit the musculoskeletal system;
- Fe improves the quality of the blood, increases resistance to stress and disease, warn fatigue, improves skin tone;
- Mn nourish the nerves and brain, causes fat and cholesterol breakdown;
- SO4 removes toxins, improves bone, hair, nails, joint fluid, spinal vertebral disc condition, anti-inflammatory effect;
- B-increases muscle mass, stimulates brain activity and strengthens bones.



Human skin

The area of skin in adults is 1.5 - 2.3 m ², and the weight of the skin – 15% of the total weight of the person.

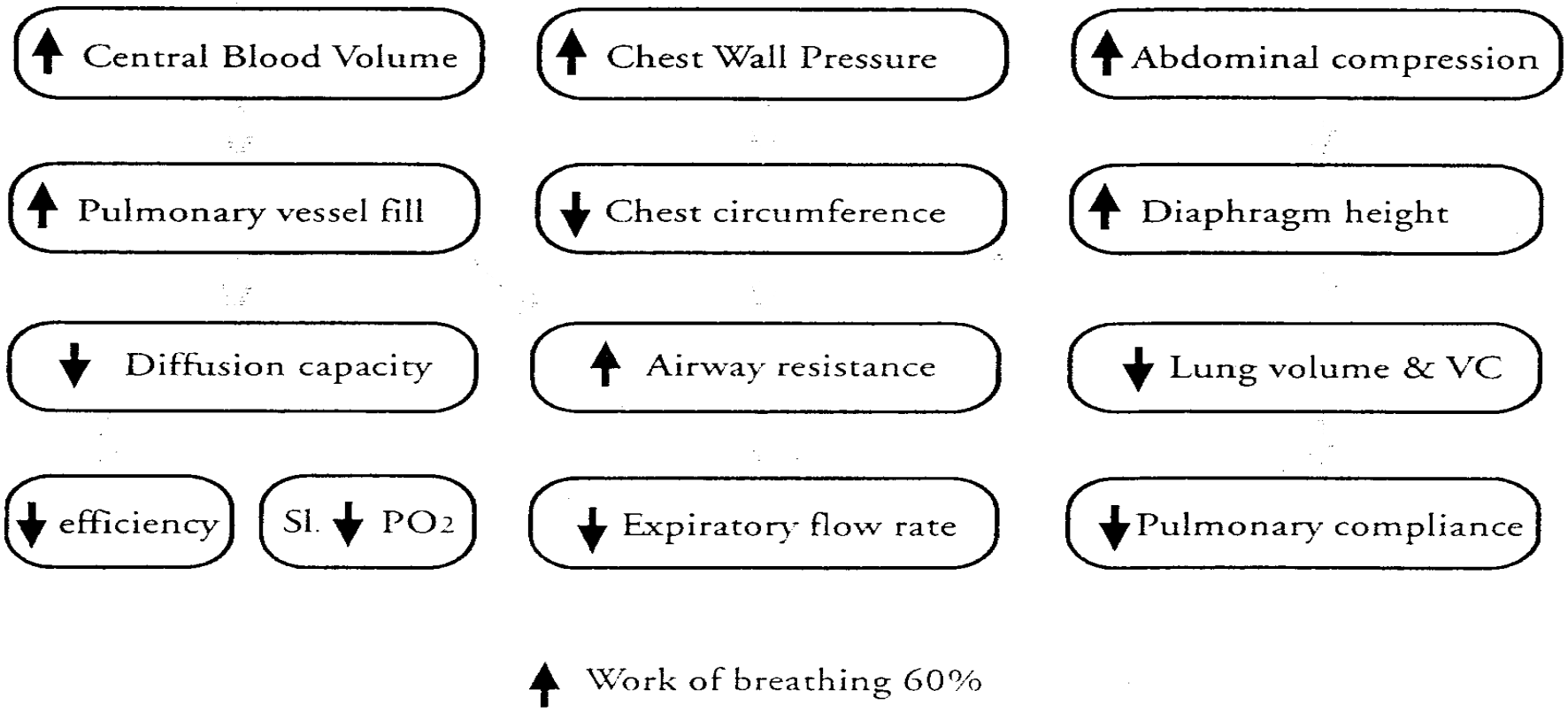


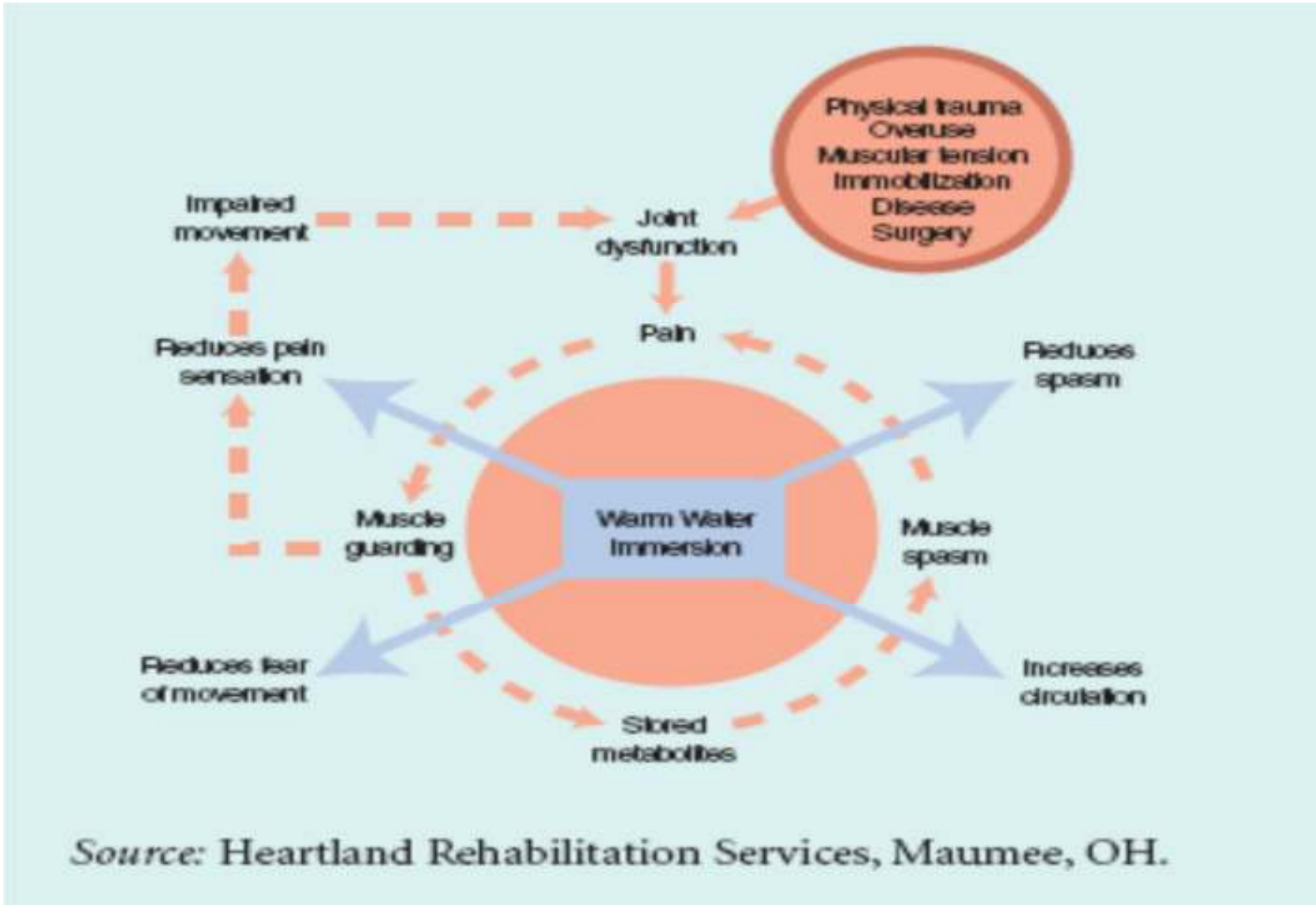
Physiological changes in the cardiovascular system during bathing

Becker BE, Cole AJ, Aquatic Rehabilitation, from Rehabilitation Medicine 1998, Raven Press

Respiratory changes (challenge) during

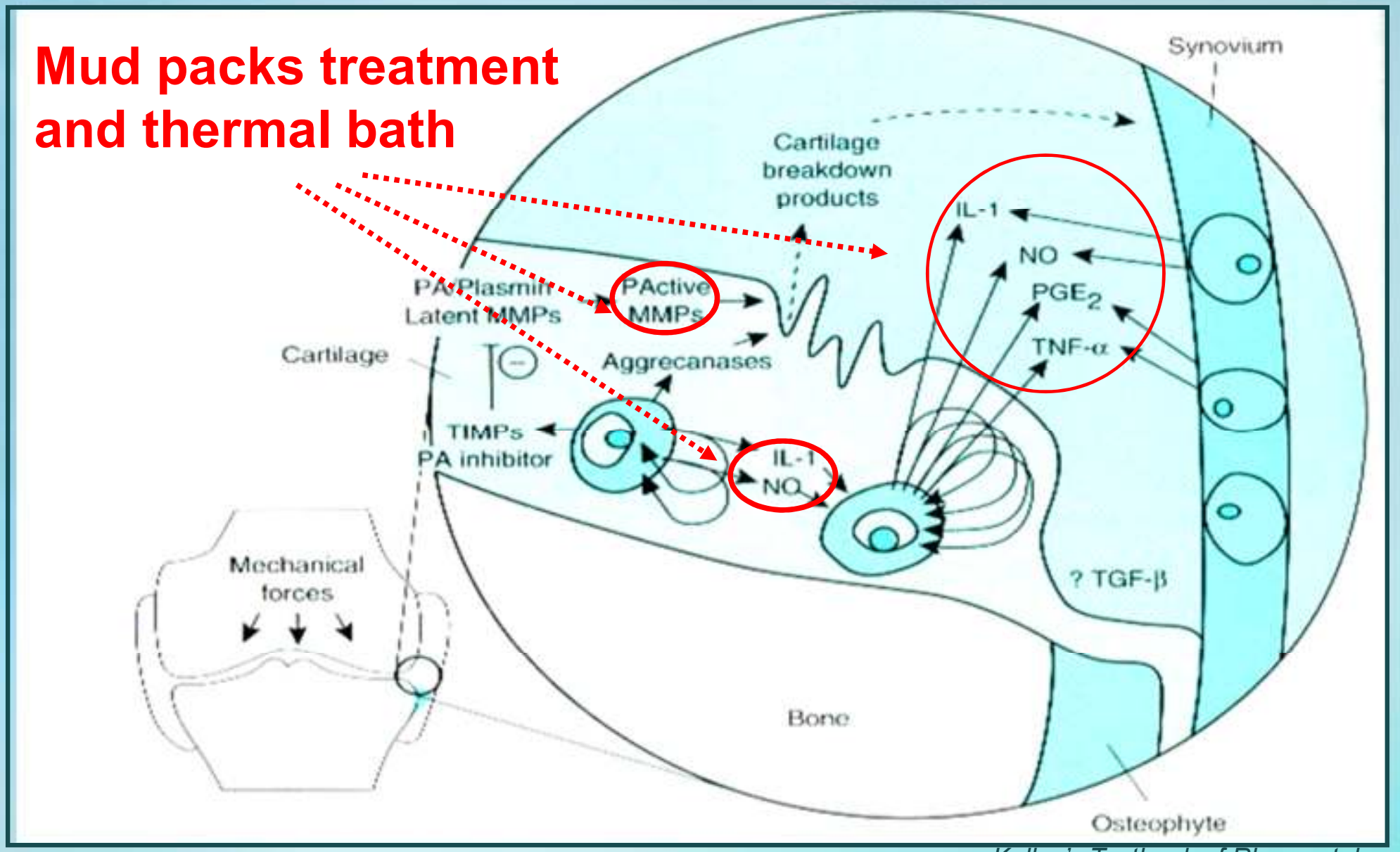
Head Out Water Immersion





Source: Heartland Rehabilitation Services, Maumee, OH.

Mud packs treatment and thermal bath

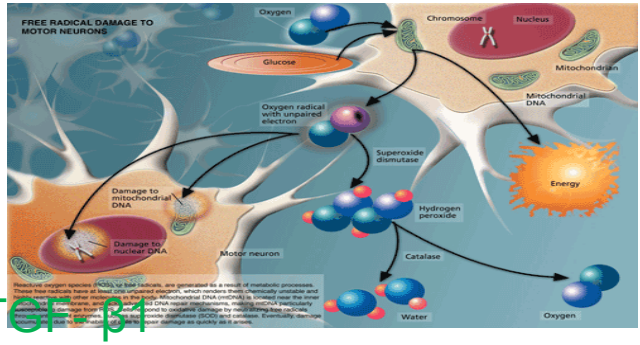


Kelley's Textbook of Rheumatology

Metabolic changes by balneotherapy

- Free Radicals
- Hormones (Increase in ANP, decrease in Renin-Activity, decrease in Aldosteron Production, decrease in Anti-Diuretic Hormone, increase in Dopamine, ACTH- ↑ or ↓ (cortisol increase, unchanged or decrease), Beta-endorphin ↑, Growth Hormone ↑, Norepinephrine ↑, Prolactin ↑)
- Lipids
- Others

Metabolic changes in balneotherapy



- Effects on cytokines: TNF-α,IL-1α IL-1β,IL-6, IFN-γ , IL-2, IL-4, EGF, TGF- β1
- Effects on prostaglandins: PGE_2, Leukotriene; LTB_4, $PGF_2\alpha$
- Effects on cells populations: Langerhanso, T- ir B-, CD4+, CD4- CD8+, CD8 cells
- Effect on CRP, haptoglobulin, substancy P
- Effect on matrix metalloproteases: MMP-1, MMP-2, MMP-3, MMP-8, MMP-9
- May stimulate secretion of opioids

M. Olah, etc. (2011). **CRP ↓, HbA1C↓, , N proANPand cystatin, HDL↑, beta-2-microglobulin↓.**
B. Kloesch*(2010) : H_2S transiently **blocks IL-6 expression** in rheumatoid arthritic fibroblast-like synoviocytes and **deactivates p44/42** mitogen-activated protein kinase.
HN Aksoy ,etc (2006). The Effect of Balneotherapy on Oxidant-Antioxidant Systems in Primary Osteoarthritis.
M.Karagulle et etc. (2006). Anti-oxidant status in patients with Rheumatoid Arthritis after Spa Therapy .
Cozzi *(2004):* **↓TNF-α, IL-1β; pl.:NO ↓, MPO ↓, Leukotriene B4 ↓, PGE_2 ↓**
T.Bender(2007): **↓ activity of catalase, superoxyd dysmutase, glutathione perxydase (after** 10 procedures).
D. Marazziti (2007**): SERT modification, affinity to SERT**.
Bellometti (2005): **MMP-3 ↓, MMP 8,9 ↑**
Bellometti (2000): **se NO ↓, se MPO ↓, se GSH peroxidase level**

Mud Pack Therapy and Thermal Bath in Rheumatoid Arthritis

➢ **Bellometti** *(2000):* **se NO ↓, se MPO ↓, se GSH-peroxidase level -**

-37 Rheumatoid arthritis patients- mud bath treatment *(20',45°C, daily)*
⇔ bath *(20', 38°C, daily)*

Background: NO *(nitric-oxid)*:

Degradation of articular cartilage

- produced by chondrocytes, fibroblasts, endothel cells affected by pro-inflammatory cytokines *(eg.:TNF-α; IL-1β);*
- inhibits collagen and proteoglycan synthesis;
- activates MMP-s;
- induces apoptosis.

-se nitrate *(>18,6 μmol/l)*, nitrite *(>1,7 μmol/l)* **concentrations** *are* higher in RA than in healthy controls *(p<0.01).*

-in active RA the serum level of nitrate and nitrite are higher than in remission *(p<0.01).*

(Y Ersoy Ann Rheum Dis 2002)

Mud Pack Therapy and Thermal Bath in Rheumatoid Arthritis

- **Cozzi** *(2004):* **Lewis rat adjuvant-arthritis (subplantar FCA inj.)**

↓

macrophage activation ↑, pro-inflammatory cytokines ↑

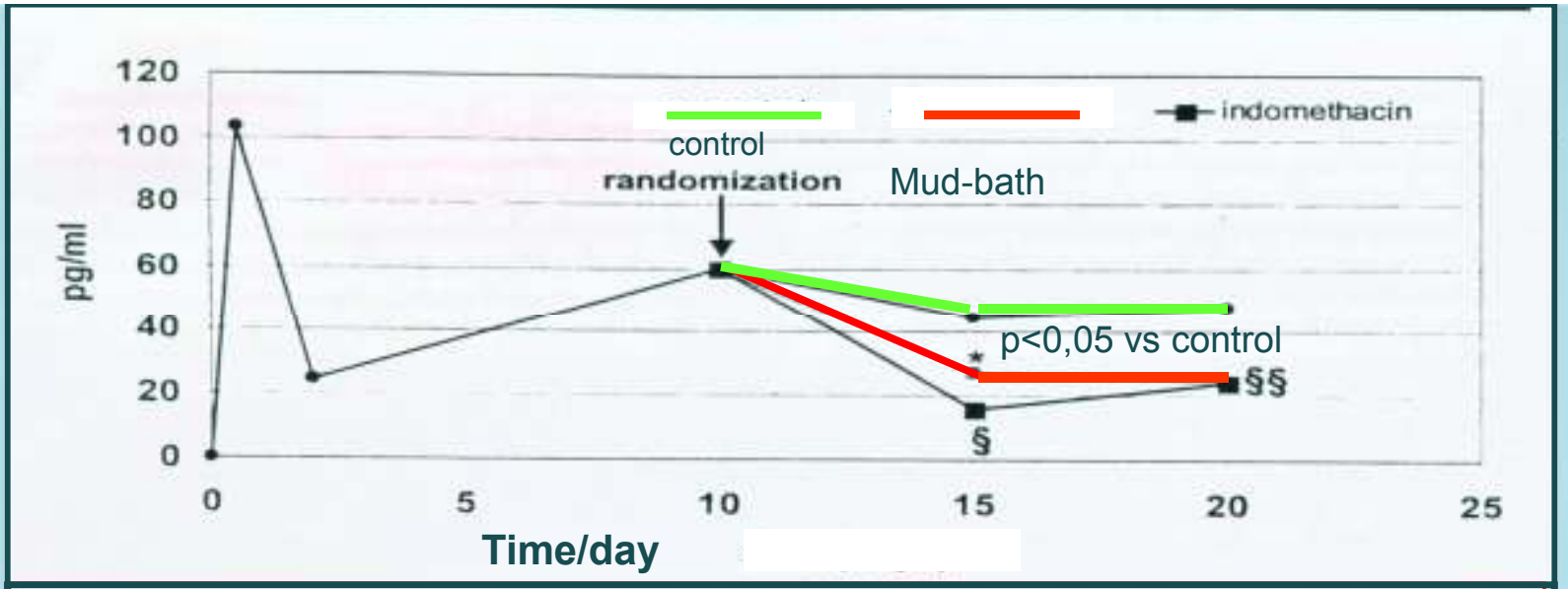
expansion of autoreactive T-and B-cells

+

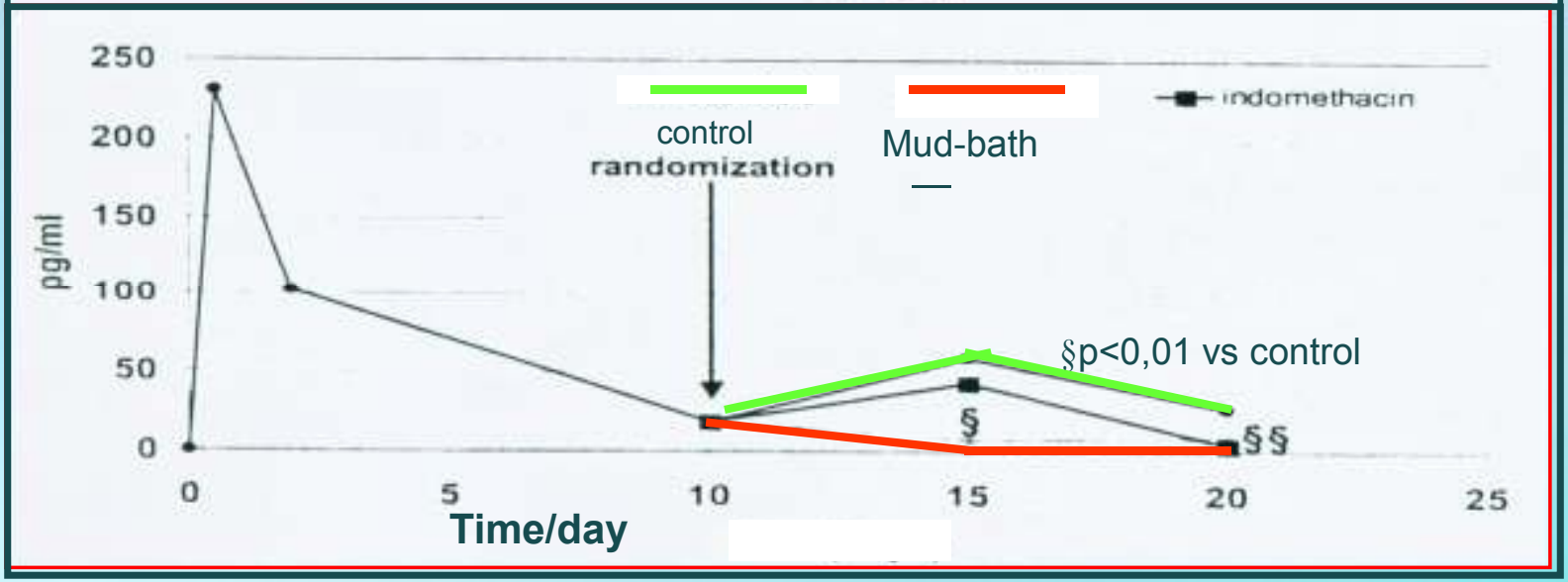
mud (*15 min; 40-42°C*)- thermal bath (*10 min, 37-38°C*)

↓

TNF-α

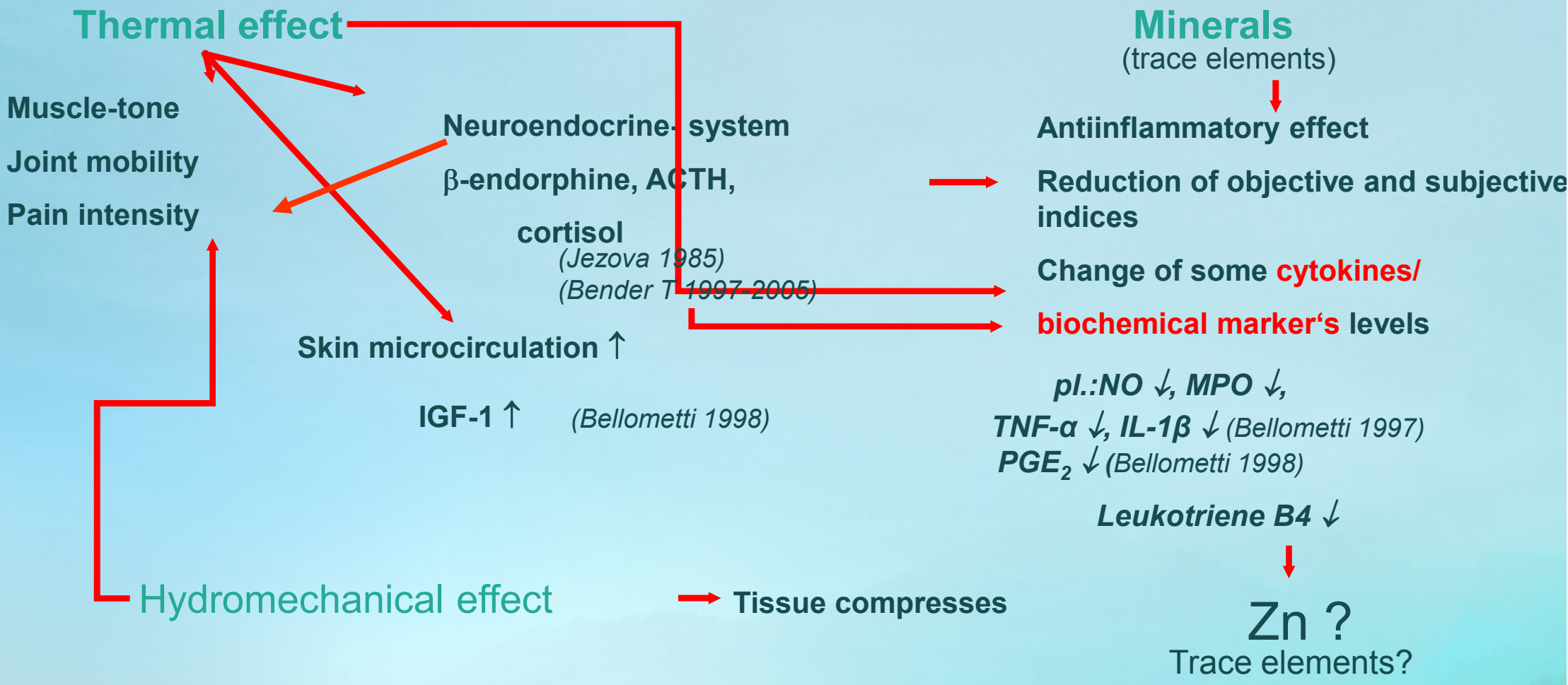


IL-1β



/F. Cozzi et al. Clinical and Exp. Rheumatology 2004 /

Mud Pack Therapy and Thermal Bath in Rheumatoid Arthritis



Efficacy of balneotherapy in OA - I

TNF α ↗ *

IL-1 ↗ **

CRP ↗ *,**

Haptoglobulin ↗ *,**

TNF α↘ ***

IL-1 ↘ ***

IGF-1 ↗ ***

MMP-3 ↓, MMP 8,9 ↑**

* Tütüncü ZN,Turan M, Barut A: Changes in TNF α plasma levels in osteoarthritic patients under balneotherapy with acratotermal water. Phys Rehab Kur Med 1996;6:80-82

** Turan M :Wirkungen der Balneotherapie auf die Akute-Phase-Reaction. IV.Deutsch-Türkischer Ärtzekongress Balneologie und Klimatologie, İzmir,Türkie 2000, Kongressbuch: 39-41

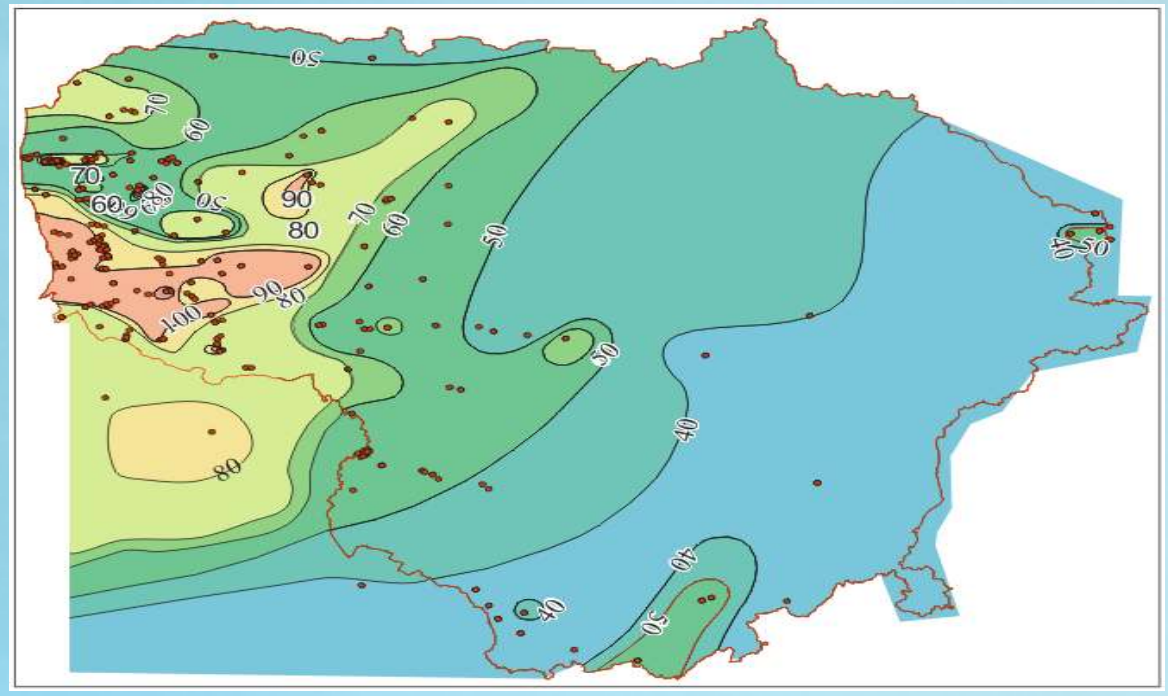
*** Bellometti S, Giannini S, Sartori L, Crepaldi G: Cytokine levels in osteoarthrosis patients undergoing mud bath therapy. Int J Clin Pharmacol Res. 1997;17(4):149-53

****Bellometti *(2005)*

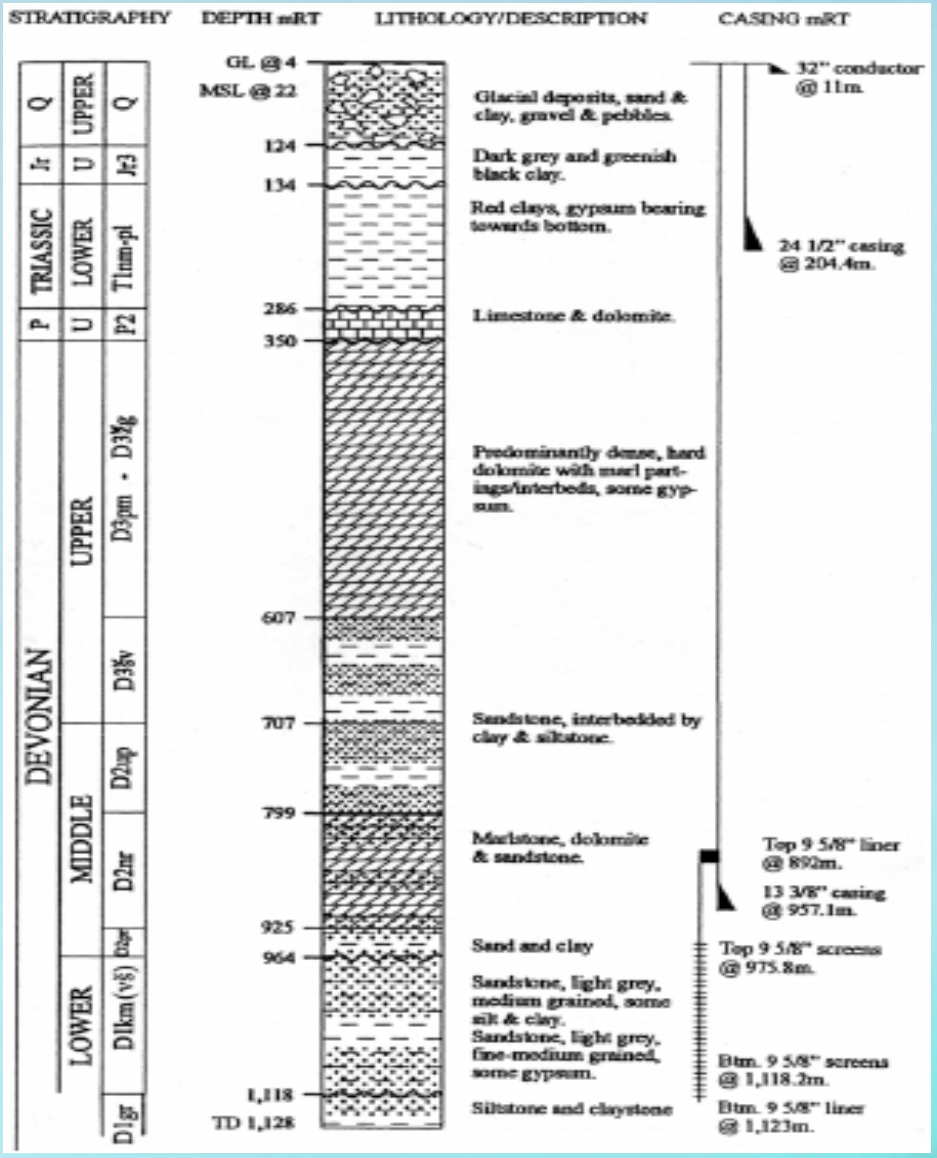
Therapeutic Effectiveness

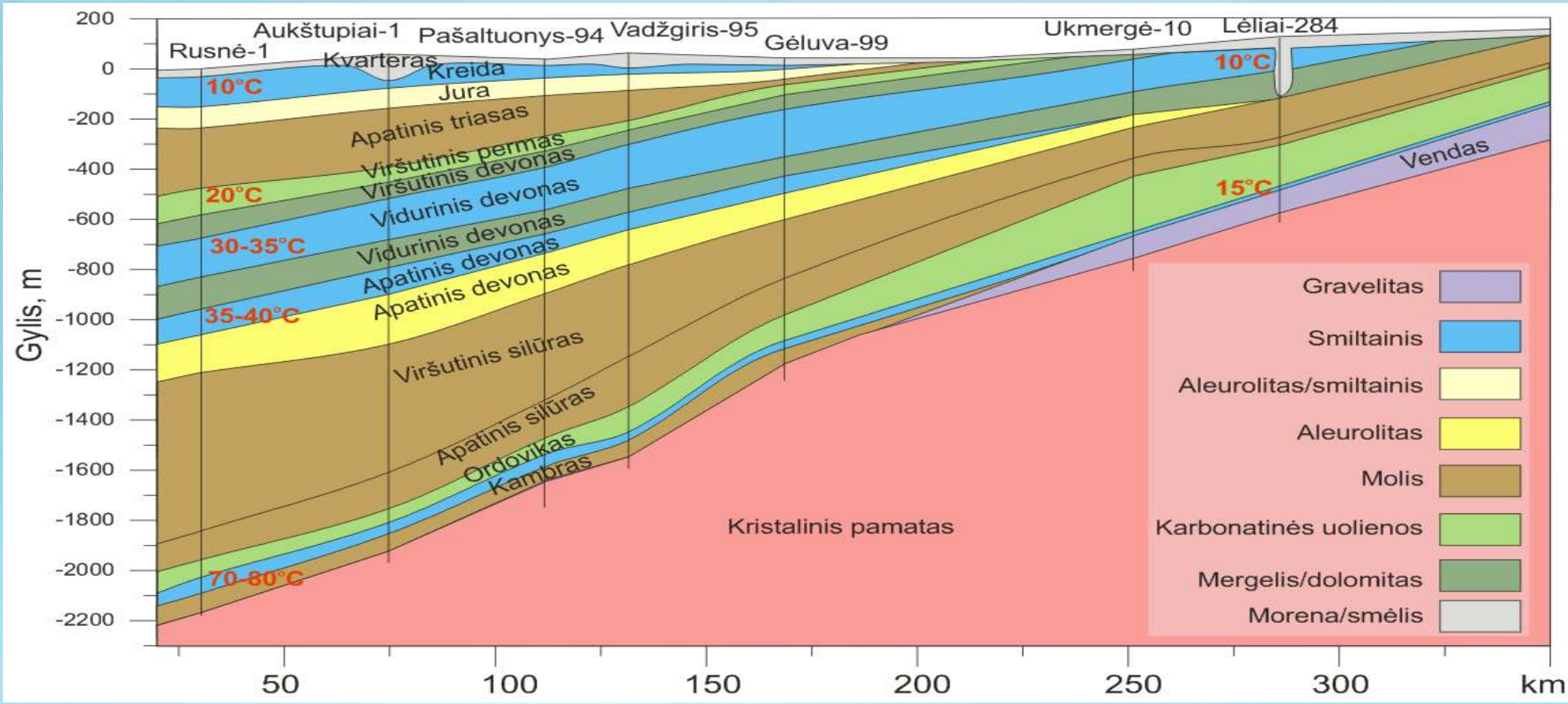
	Sulfur Water Balneotherapy	Thermomineral Balneotherapy	Tap Water Hydrotherapy
Rheumatoid Arthritis	↑↑↑	↑	?↑
Knee Osteoarthritis	↑↑↑	↑↑	↑
Low back pain	↑↑↑	↑↑	↑
Fibromyalgia	↑↑↑	↑↑	?↑

Balneotherapy- art of healing with water. Sources.



Lithuania heat flow map (mW/m2).
Red points - drillings





Lithuanian geological cross-section west-east. The blue color indicates the main sandy aquifers, which can be used for geothermal stations.

Mineral content in different sources of water **(mg/L)**

Minerals	Geoterma	Dead sea[1]	Sea av[1]	River[2]	Wairakei, 1,5 km NZ[2]	Lintong, China	Terma Bania, Krakow	Karaali, Turkey	Pagosa Springs, USA	EU/USA[3]
Na	27580	36600	10500	4.8	1200	326.5	285.5	44.2	790	>200
K	690	7800	380	2	200	3.4	37.05	14.5	90	0-90
Mg	2630	45900	1270	0.004	-	14.2	44.88	18.24	25	>50
Ca	8990	17600	400	15	17.5	33.9	193.4	110,22	-	>150
Cl	66930	212400	19000	5.7	2156	193.2	325	75.15	180	>200
SO4	1330	470	2650	6.7	25	277.2	665	38.33	1400	>200
SiO2	4.886	-	0.005-0.01	13	660	-	-	-	54	/
HCO3	74	220	140	23	32	384.5	208	280	-	>600
Li	1.2		0.18	-	13.2	-	0.491	-	2.9	/
F	0.91	-	0.0013	-	8.1	3.5	0.22	0.9	4.3	>1
HBO2	4.842	-	0.0039	-	115	-	20.35	-	1.8	
Fe	12.14		-	-	-	-	2.78	-	0.08	>1
Br	<0.2	5920	-		-	-	0.35	-	-	9.7

John W. Lund, GHC BULLETIN, SEPTEMBER 2000,[1] XIII-Water-A-Geothermal-1[2], pagal EU(2009) ir JAV spa kriterijus [3]

UAB "Grota" Analitinė laboratorija
Eišiškių pl.26. LT-02184 Vilnius; tel.: 8-5-2

VANDENS BENDROSIOS CHEMINĖS ANAI

Užsakovas	UAI
Objektas	Geot
Punktas	Taškas
Mėginio paėmimo data	2

Tirta analitė	Nustatyta v	
	mg/l	mg-ekv/l
Anijonai		
Cl^-	66930	1886.947
SO_4^{2-}	1330	27.708
HCO_3^-	74	1.213
CO_3^{2-}	0.036	0.001
NO_2^-	<0.05	0
NO_3^-	<0.5	0
Katijonai		
Na^+	27580	1199.13
K^+	690	17.647
Ca^{2+}	8990	448.603
Mg^{2+}	2630	216.461
NH_4^+	<0.05	0
Viso anijonų		1915.869
Viso katijonų		1881.841
BALANSAS		-34.028

Kitos analitės			
Bendras kietumas	665.06	mg-ekv/l	SVP_2011-17V
Karbonatinis kietumas	1.21	mg-ekv/l	
Nekarbonatinis kietumas	663.85	mg-ekv/l	
Ištirpusių mineralinių medžiagų suma	108224	mg/l	
CO_2 pusiausvyrinis	113.58	mg/l	Apskaičiuojama
pH	6.07	pH vienetai	LST ISO 10523:2009
Savitasis elektros laidis	126300	µS/cm25°C	LST EN 27888 : 2002
Permanganato skaičius	36.30	mgO_2/l	LST EN ISO 8467 : 2002

Analizę atliko: Laboratorijos vadovė Zita Šalaviejienė

Užsakymo Nr.	121105KT090

UAB "Grota" Analitinė laboratorija
Eišiškių pl.26. LT-02184 Vilnius; tel.: 8-5-21643

INDIVIDUALIŲ VANDENS CHEMINĖS SUDĖTIES RODIK REZULTATŲ PROTOKOLAS

Užsakovas	UAB "Geoterma"
Objektas	Geoterminis vanduo
Punktas	Taškas T17 (2P gręžinys)
Mėginio paėmimo data	2012-10-29

Tirta analitė	Mato vnt.	Nustatyta vertė
Geležis (Fe) bendra	mg/l	12.14
Boratas (B)	mg/l	4.842
Bromidas (Br-)	mg/l	<0.2
Fluoridas (F-)	mg/l	0.91
Silicis (Si)	mgSi/l	4.714

Analizę atliko: Laboratorijos vadovė Zita Šalaviejienė

Užsakymo Nr.:	121105KT090

FIZINIŲ IR TECHNOLOGIJOS MOKSLŲ CENTRAS

Valstybinis mokslinių tyrimų institutas Fizinių ir technologijos mokslų centras

Valstybės biudžetinė įstaiga, Savanorių pr. 231, LT-02300 Vilnius, Tel. (8 5) 260 1643/1642, faks. (8 5) 260 2317, el. paštas info@ftmc.lt
Duomenys kaupiami ir saugomi Juridinių asmenų registre, Kodas 302456126, PVM kodas LT100006300110

Užsakovui
UAB „GEOTERMA"
Lypkių 53, LT-94100, Klaipėda
Faksas: (846) 326184
Telefonai: (846) 326163

2012-12-20 Nr. SR-1300-1101
Nr.

DĖL CHEMINĖS ANALIZĖS ATLIKIMO
Mėginį pristatė: užsakovas 2012-12-07
Tiriamojo objekto pavadinimas: geoterminis vanduo
Ėminio surinkimo vieta: Taškas T16 (2P gręžinys)
Ėminio surinkimo data: 2012-12-04
Ėminio NR. 226

Sunkiųjų metalų nustatymui mėginiai nufiltruoti, sukoncentruoti ir analizuoti optinės emisinės spektrometrijos metodu, taikant induktyviai susietą plazmą (*Optima7000DV, Perkin Elmer, JAV*) pagal LST EN ISO 11885.

Nustatyta:

Nr.	Elementas	Koncentracija, mg/L
1	Arsenas (As)	-
2	Aliuminis (Al)	0,050
3	Boras (B)	6,501
4	Beris (Be)	-
5	Kadmis (Cd)	0,007
6	Kobaltas (Co)	0,013
7	Chromas (Cr)	0,007
8	Varis (Cu)	0,167
9	Litis (Li)	1,200
10	Manganas(Mn)	0,501
11	Nikelis(Ni)	0,011
12	Švinas Pb	0,050
13	Talis (Tl)	-
14	Cinkas (Zn)	0,062
15	Gyvsidabris (Hg)	-
16	Silicis (Si)	4,886

Direktoriaus pavaduotojas Remigijus Juškėnas

Tyrimus atliko
Dr. Jūratė Valančienė,
tel. (8 5) 2648856, mob.: 8 673 48382, e-paštas: j.valan@chi.lt

Biomedical research
"Stress and fatigue in maritime workers and opportunities for its reduction”

- **Objective for balneotherapy**: To evaluate effects of geothermal water bath on human well-being and cardiovascular, respiratory and musculoskeletal systems.

Study Diagram

352 survey participants
201 seafarers, 151 other shore staff

50 Patients randomized into two groups

44 patient completed
3. month measurements

n=65 seafarers
Balneotherapy

n=36 seafarers
Music therapy

n-50 seafarers
No treatment

Male working in sea,
age 47 years (25-64), BMI 27 (20.8-33.3).

10 day duration
Baths in Seamens HCC
outcome measurements
Before therapy- end of therapy

55 participants completed 6-10 procedure course

Prevalence: 74% of joint pain, 34% - headaches, 44% - cardiovascular, diseases (33% hypertension), 22% - nervous system problems, 14% of respiratory system, 20% - digestive system, 13% - kidneys problems, 10% skin diseases, 4% DM. 16% had an allergic history, 60% were taking medication (29% - anti-hypertensive).

Balneotherapy with geothermal water branch

- The course - average of 8.5 procedures (6-10 bath).
- The procedure lasted 15 minutes. There were advised to move in the bath tub.
- Bath temperature 34.6 ° C (33.9-35.0 ° C).
- Water mineralization 108g / l, pH 6.07, drill 2P (1135m).
- Evaluation parameters: blood pressure (BP), heart rate (HR), respiration rate (RR), skin temperature and stiffness, spinal mobility (finger-floor distance), the participant's feelings: pain (10-point scale), muscle strength, mood and overall well-being were evaluated in 5 point rating scale.
- Before and after the course of the treatment the participant went clinical examination and psychoemotional condition was measured with aid of 4 scales (gereral distress symptom scale (GSDS), mood, fatigue scale (MFL-20L) and cognitive failure questionnaire (CFQ)
- Statistical analysis was performed using SPSS 21 package, Kolmagorov-Smirnov, Student's, Wilcoxon tests, GLM method, Sidak'o, Friedman, Fisher's z-test. Significance level of testing hypotheses was 0.05.

Priedas Nr: 7A

Kodas:

Balneoterapijos procedūrų stebėjimo protokolas

	PRIEŠ PROCEDŪRĄ						PO PROCEDŪROS						
Diena Vonios t°	Sovijautis 1. Skausmas (galvos, sąnarių, nugaros, pilvo, kt), stiprumas(0-10b) 2. Raumenų jėga(1-5 b) 3. Nuotaika(1-5b) 4. Kiti pojūčiai 5. Bendra savijauta(1-5b)	AKS	ŠSD	KD	T°, odos spalva, temuma	Pirštų-grindų atstumas (cm)	Sovijautis 1. Skausmas (galvos, sąnarių, nugaros, pilvo, kt), stiprumas(0-10b) 2. Raumenų jėga(1-5 b) 3. Nuotaika(1-5 b) 4. Kiti pojūčiai 5. Bendra savijauta(1-5 b)	AKS	ŠSD	KD	T°, odos spalva, temuma	Pirštų-grindų atstumas (cm)	Pastabos
1 diena													
2 diena													
3 diena													
4 diena													

Pain
0 - no pain
10 - excruciating pain
Muscle strength
1-weak
2- satisfactory
3 - Good
4 - very good
5 - Excellent
Mood
1 - Bad
2 - satisfactory
3 - Good
4-very good
5 - Excellent
General well-being
1 - Bad
2 - satisfactory
3 - Good
4 - very good
5 - Excellent

Priedas Nr.2

Kodas: data:

BENDRA DISTRESO SIMPTOMŲ SKALĖ

Žemiau pateiktoje lentelėje išvardinti simptomai; pažymėkite tuos, kuriuos šiuo metu jaučiate, ženklu „√" nurodytame kvadrate. Jei simptomo nėra, palikite kvadratą tuščią.

1 □ Depresija ( )	7 □ Skausmas ( )
2 □ Nerimas ( )	8 □ Miego sunkumai ( )
3 □ Nuovargis ( )	9 □ Žarnyno problemos ( )
4 □ Dusulys ( )	10 □ Sunku susikaupti ( )
5 □ Pykinimas ( )	11 □ Apetito netekimas ( )
6 □ Vėmimas ( )	12 □ Kosulys ( )
□ Kiti ( )	

Kiekvienam simtomui, kurį jūs pažymėjote „√" kvadrate kairėje, parašykite atitinkamą skaičių (1, 2, 3) skliaustuose dešinėje, priklausomai nuo to, kuris yra labiausiai jus varginantis (pažymėkite 1 labiausiai varginantį, 2- sekantį labiausiai varginantį, 3 ir taip toliau, kol visi pažymėti „√" simptomai turės skaičių, rodantį jo patologinės būklės lygį).

Kiek jus vargina visi jūsų nurodyti simptomai bendrai :

Visai nevargina----------Ypatingai vargina
1 2 3 4 5 6 7 8 9 10

Kaip gerai jūs galite valdyti savo simptomus?

Visai negaliu suvaldyti----------Galiu valdyti ypatingai gerai
1 2 3 4 5 6 7 8 9 10

General Symptom Distress Scale

Examiner: *I am going to read a list of symptoms; I want you to tell me which ones you have at the present time.*

Put a check mark "√" in the box to the left of the symptom, for each one symptom the participant indicates as being present. Leave the check box blank if the symptom is not present.

1 □ Depression ( )	7 □ Pain ( )
2 □ Anxiety ( )	8 □ Sleep Difficulties ( )
3 □ Fatigue ( )	9 □ Bowel Problems ( )
4 □ Shortness of Breath ( )	10 □ Difficulty Concentrating ( )
5 □ Nausea ( )	11 □ Loss of Appetite ( )
6 □ Vomiting ( )	12 □ Cough ( )
□ Other ( )	

Examiner: *Now of those symptoms you told me you had, which is the most distressing? (Score (1) which one is the most distressing? Score (2) which one is the next most distressing? Score (3) and so on until all symptoms that were reported have been ranked in order (i.e., assigned a numerical score).*

For each symptom that has a check mark "√" in the box to the left, write the corresponding number (i.e., 1, 2, 3) related to which is the most distressing in the parentheses to the right of the symptom. Every symptom with a "√" to the left should have a number indicating its level of distress to the right.

Examiner: *Now on a scale of 1 to 10, with 1 being not at all distressing and 10 being extremely distressing:*

In general, how distressing are all of your symptoms to you?

Not at all Distressing----------Extremely Distressing
1 2 3 4 5 6 7 8 9 10

Examiner: *Again on a 1 to 10 scale, this time with 1 being cannot manage at all and 10 being can manage extremely well:*

How well are you able to manage your symptoms?

Cannot Manage at All----------Can Manage Extremely Well
1 2 3 4 5 6 7 8 9 10

Priedas Nr.3

Kodas data:

NUOTAIKOS SKALĖ

Žemiau išvardintos įvairios nuotaikų būsenos. Prašome jūsų pažymėti brūkšneliu ant linijos tą nuotaiką, kuri vyrauja paskutines 2 savaites (pvz.:mieguistas_____/_____budrus)

Mieguistas	Budrus
Atsipalaidaves	Susijaudinęs
Stiprus	Silpnas
Sutrikęs	Aiškaus mąstymo
Koordinuotas	Nevikrus
Mieguistas	Energingas
Patenkintas	Nepatenkintas
Nerimaujantis	Ramus
Lėtai suvokiantis	Nuovokus
Įtampa	Ramybė
Dėmesingas	Svajingas
Nekompetetingas	Patyręs
Priešiškas	Draugiškas
Susidomėjęs	Nuobodžiaujantis
Atsiribojęs	Bendraujantis
Depresiškas	Linksmas
Orientuotas į save (Egocentriškas)	Orientuotas į kitus

Mood Scales used in performance tasks

Drowsy	Alert
Relaxed	Excited
Strong	Feeble
Muzzy	Clear-headed
Coordinated	Clumsy
Lethargic	Energetic
Contented	Discontented
Troubled	Tranquil
Mentally slow	Quick-witted
Tense	Calm
Attentive	Dreamy
Incompetent	Proficient
Happy	Sad
Antagonistic	Friendly
Interested	Bored
Withdrawn	Sociable
Depressed	Elated
Self-centred	Outward-going

MFI-20 L

Priedas Nr.4

Kodas Užpildymo data:

Daugiamatis nuovargio klausimynas (MFL-20L)

Užduodami šiuos klausimus, mes norime sužinoti apie Jūsų savijautą pastaruoju metu. Prašome pažymeti langelį,kuris geriausiai tai nurodo. Kuo labiau Jūs nesutinkate su teiginiu, tuo ženkleį „X" žymite arčiau sakinio, "Ne,tai netiesa"(dešinėn) ir, atvirkščiai, jei sutinkate su teiginiu, tuo arčiau sakinio „Taip, tai tiesa"(kairėn).

1.	Aš jaučiuosi stiprus		
	Taip, tai tiesa		*Ne, tai netiesa*
2.	Fiziškai aš jaučiuosi galįs padaryti mažai		
	Taip, tai tiesa		*Ne, tai netiesa*
3.	Aš jaučiuosi labai aktyvus		
			Ne, tai netiesa
4.	Aš jaučiuosi taip, lyg galėčiau padaryti viską		
	Taip, tai tiesa		*Ne, tai netiesa*
5.	Aš jaučiuosi pavargęs		
	Taip, tai tiesa		*Ne, tai netiesa*
6.	Aš galvoju, kad per dieną padarau daug		
	Taip, tai tiesa		*Ne, tai netiesa*
7.	Kai aš ką nors darau, galiu gerai sukaupti savo mintis		
	Taip, tai tiesa		*Ne, tai netiesa*
8.	Fiziškai aš galiu padaryti daug		
	Taip, tai tiesa		*Ne, tai netiesa*
9.	Aš beminuosi, kai reikia ką nors daryti		
	Taip, tai tiesa		*Ne, tai netiesa*
10.	Aš manau, kad labai mažai ką padarau per dieną		
	Taip, tai tiesa		*Ne, tai netiesa*
11.	Aš galiu gerai susikaupti		
	Taip, tai tiesa		*Ne, tai netiesa*
12.	Aš esu pailsėjęs		
	Taip, tai tiesa		*Ne, tai netiesa*
13.	Man reikia daug pastangų susikaupti		
	Taip, tai tiesa		*Ne, tai netiesa*
14.	Fiziškai aš jaučiuosi esantis prastos būklės		
	Taip, tai tiesa		*Ne, tai netiesa*
15.	Aš turiu daug planų		
	Taip, tai tiesa		*Ne, tai netiesa*
16.	Aš greitai pavargstu		
	Taip, tai tiesa		*Ne, tai netiesa*
17.	Aš galiu nedaug padaryti		
	Taip, tai tiesa		*Ne, tai netiesa*
18.	Aš nesijaučiu galįs ką nors padaryti		
	Taip, tai tiesa		*Ne, tai netiesa*
19.	Mano mintys lengvai nuklysta		
	Taip, tai tiesa		*Ne, tai netiesa*
20.	Fiziškai aš jaučiuosi puikiai		
	Taip, tai tiesa		*Ne, tai netiesa*

General fatigue
Physical fatigue
Reduced activity
Reduced motivation
Mental fatigue

MFI® MULTIDIMENSIONAL FATIGUE INVENTORY

© E. Smets, B.Garssen, B. Bonke.

Instructions:

By means of the following statements we would like to get an idea of how you have been feeling **lately**. There is, for example, the statement:

"I FEEL RELAXED"

If you think that this is **entirely true**, that indeed you have been feeling relaxed lately, please, place an **X** in the extreme left box; like this:

yes, that is true ☒1 ☐2 ☐3 ☐4 ☐5 **no, that is not true**

The more you **disagree** with the statement, the more you can place an **X** in the direction of "no, that is not true". Please do not miss out a statement and place only one **X** in a box for each statement.

1	I feel fit.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
2	Physically, I feel only able to do a little.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
3	I feel very active.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
4	I feel like doing all sorts of nice things.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
5	I feel tired.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
6	I think I do a lot in a day.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
7	When I am doing something, I can keep my thoughts on it.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
8	Physically I can take on a lot.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
9	I dread having to do things.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
10	I think I do very little in a day.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
11	I can concentrate well.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
12	I am rested.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
13	It takes a lot of effort to concentrate on things.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
14	Physically I feel I am in a bad condition.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
15	I have a lot of plans.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
16	I tire easily.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
17	I get little done.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
18	I don't feel like doing anything.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
19	My thoughts easily wander.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true
20	Physically I feel I am in an excellent condition.	yes, that is true	☐1	☐2	☐3	☐4	☐5	no, that is not true

PAŽINTINIŲ NESĖKMIŲ KLAUSIMYNAS (CFQ)

Čia rasite klausimus apie nedideles klaidas, kurias kiekvienas vienu ar kitu metu daro me. Mes norime sužinoti, kaip dažnai per pastaruosius **šešis** mėnesius jums nutiko šie dalykai (prašome prie kiekvieno klausimo pažymėti jums tinkantį langelį).

		Labai dažnai	Gana dažnai	Kartais	Labai retai	Niekada
1.	Ar būna, kad, ką nors skaitant, jūs suvokiate, kad negalvojote apie tai, ir turite tai perskaityti dar kartą?	☐4	☐3	☐2	☐1	☐0
2.	Ar būna, kad jūs pamirštate, kodėl jūs nuėjote iš vieno buto/namo galo į kitą?	☐4	☐3	☐2	☐1	☐0
3.	Ar būna, kad nepastebite ženklų kelyje?	☐4	☐3	☐2	☐1	☐0
4.	Ar pasitaiko, kad sumaišote kairę ir dešinę, kai nurodote kryptis?	☐4	☐3	☐2	☐1	☐0
5.	Ar būna, kad atsitrenkiate į žmones?	☐4	☐3	☐2	☐1	☐0
6.	Ar būna, kad suvokiate, kad neprisimenate, ar išjungėte šviesą ir ugnį, užrakinote duris?	☐4	☐3	☐2	☐1	☐0
7.	Ar jums nepavyksta išgirsti žmonių vardų, kai juos sutinkate?	☐4	☐3	☐2	☐1	☐0
8.	Ar būna, kad pasakote ką nors, o vėliau suvokiate, kad tai galėjo būti priimta kaip įžeidimas?	☐4	☐3	☐2	☐1	☐0
9.	Ar būna, kad negirdite su jumis kalbančių žmonių, kai jūs darote ką nors kita?	☐4	☐3	☐2	☐1	☐0
10.	Ar jūs prarandate savitvardą ir to gailitės?	☐4	☐3	☐2	☐1	☐0
11.	Ar paliekate svarbius laiškus neatsakytus kelias dienas?	☐4	☐3	☐2	☐1	☐0
12.	Ar būna, kad pamirštate, į kurią pusę pasukti gerai žinomu, tik retai naudojamu keliu?	☐4	☐3	☐2	☐1	☐0
13.	Ar būna, kad prekybos centre nepavyksta pamatyti, tai, ko ieškote (nors tai ten yra)?	☐4	☐3	☐2	☐1	☐0
14.	Ar pasitaiko, kad staiga tampa įdomu, ar teisingai panaudojote žodį?	☐4	☐3	☐2	☐1	☐0
15.	Ar būna sunku sužadinti mąstymą?	☐4	☐3	☐2	☐1	☐0
16.	Ar jūs pamirštate susitikimus?	☐4	☐3	☐2	☐1	☐0
17.	Ar jūs pamirštate, kur padėjote laikraštį ar knygą?	☐4	☐3	☐2	☐1	☐0
18.	Ar būna, kad atsitiktinai išmetate daiktą, kurio jums reikia, o paskui tai, ką planavote išmesti (pvz.: išmetate pirną degtukų dėžutę, o panaudotą degtuką įsidedate į kišenę)?	☐4	☐3	☐2	☐1	☐0
19.	Ar būna, kad jūs užsisvajojate, kai turėtumėte kažko klausytis?	☐4	☐3	☐2	☐1	☐0
20.	Ar būna, kad pamirštate žmonių vardus?	☐4	☐3	☐2	☐1	☐0
21.	Ar būna, kad pradedate namuose daryti vieną dalyką ir nukrypstate daryti ką nors kita (nesąmoningai)?	☐4	☐3	☐2	☐1	☐0
22.	Ar būna, kad visai negalite prisiminti kažko, nors tai yra "ant liežuvio galo"?	☐4	☐3	☐2	☐1	☐0
23.	Ar pasitaiko, kad jūs pamirštate, ko atėjote nusipirkti į parduotuvę?	☐4	☐3	☐2	☐1	☐0
24.	Ar jums krenta daiktai?	☐4	☐3	☐2	☐1	☐0
25.	Ar jums būna, kad nesugalvojate, ką pasakyti?	☐4	☐3	☐2	☐1	☐0

The Cognitive Failures Que

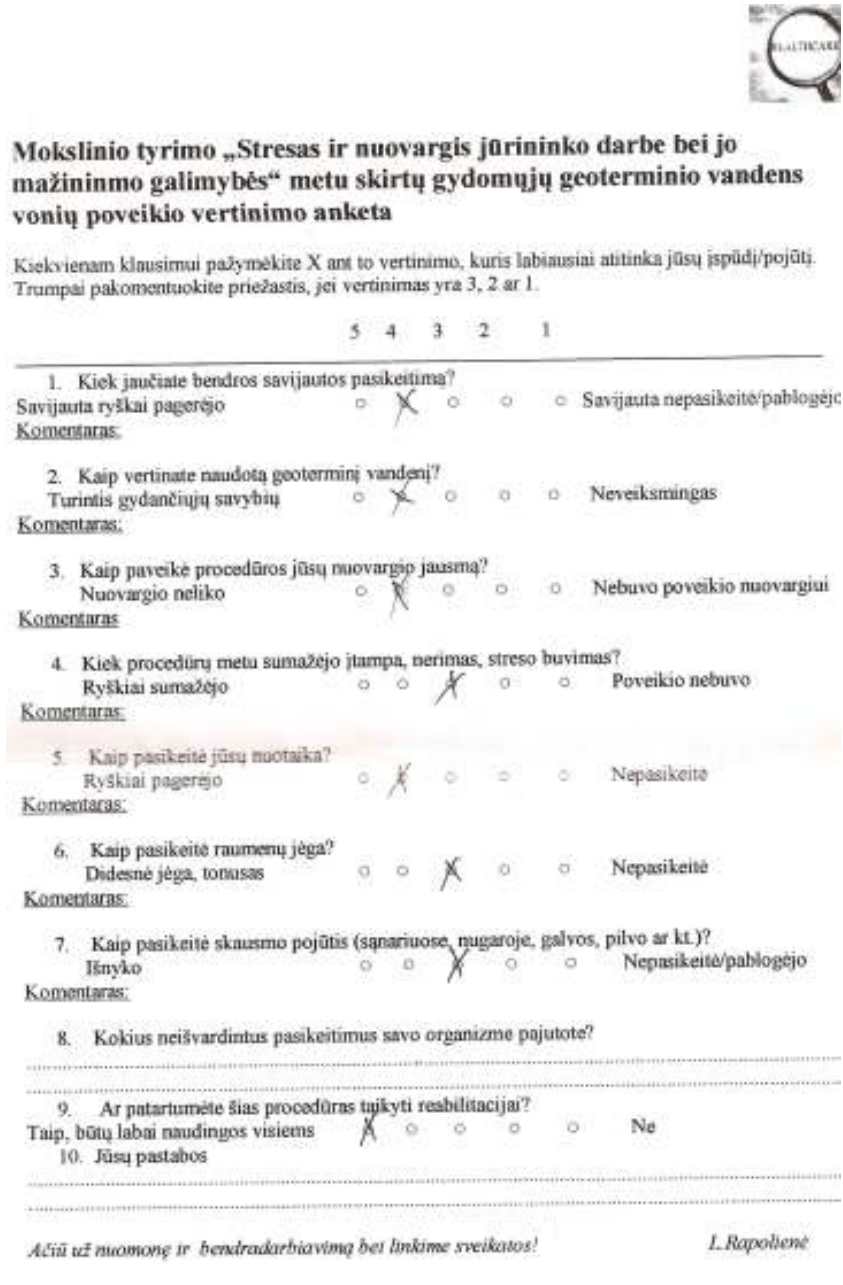
The CFQ is a 25-item sel
and motor function in the
are asked to rate the freq
0-Never, 1-Very rarely, 2-

Appendix 1

The following questions are about minor mistakes which everyone makes from time to time, but some of which happen more often than others. We want to know how often these things have happened to you in the last six months. Please circle the appropriate number.

	Very often	Quite often	Occasionally	Very rarely	Never
1. Do you read something and find you haven't been thinking about it and must read it again?	4	3	2	1	0
2. Do you find you forget why you went from one part of the house to the other?	4	3	2	1	0
3. Do you fail to notice signposts on the road?	4	3	2	1	0
4. Do you find you confuse right and left when giving directions?	4	3	2	1	0
5. Do you bump into people?	4	3	2	1	0
6. Do you find you forget whether you've turned off a light or a fire or locked the door?	4	3	2	1	0
7. Do you fail to listen to people's names when you are meeting them?	4	3	2	1	0
8. Do you say something and realize afterwards that it might be taken as insulting?	4	3	2	1	0
9. Do you fail to hear people speaking to you when you are doing something else?	4	3	2	1	0
10. Do you lose your temper and regret it?	4	3	2	1	0
11. Do you leave important letters unanswered for days?	4	3	2	1	0
12. Do you find you forget which way to turn on a road you know well but rarely use?	4	3	2	1	0
13. Do you fail to see what you want in a supermarket (although it's there)?	4	3	2	1	0
14. Do you find yourself suddenly wondering whether you've used a word correctly?	4	3	2	1	0
15. Do you have trouble making up your mind?	4	3	2	1	0
16. Do you find you forget appointments?	4	3	2	1	0
17. Do you forget where you put something like a newspaper or a book?	4	3	2	1	0
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away – as in the example of throwing away the matchbox and putting the used match in your pocket?	4	3	2	1	0
19. Do you daydream when you ought to be listening to something?	4	3	2	1	0
20. Do you find you forget people's names?	4	3	2	1	0
21. Do you start doing one thing at home and get distracted into doing something else (unintentionally)?	4	3	2	1	0
22. Do you find you can't quite remember something although it's 'on the tip of your tongue'?	4	3	2	1	0
23. Do you find you forget what you came to the shops to buy?	4	3	2	1	0
24. Do you drop things?	4	3	2	1	0
25. Do you find you can't think of anything to say?	4	3	2	1	0

Geothermal water bath impacts assessment



Mokslinio tyrimo „Stresas ir nuovargis jūrininko darbe bei jo mažininmo galimybės“ metu skirtų gydomųjų geoterminio vandens vonių poveikio vertinimo anketa

Kiekvienam klausimui pažymėkite X ant to vertinimo, kuris labiausiai atitinka jūsų įspūdį/pojūtį. Trumpai pakomentuokite priežastis, jei vertinimas yra 3, 2 ar 1.

5 4 3 2 1

1. Kiek jaučiate bendros savijautos pasikeitimą?
Savijauta ryškai pagerėjo ○ X ○ ○ ○ Savijauta nepasikeitė/pablogėjo
Komentaras:

2. Kaip vertinate naudotą geoterminį vandenį?
Turintis gydančiųjų savybių ○ X ○ ○ ○ Neveiksmingas
Komentaras:

3. Kaip paveikė procedūros jūsų nuovargio jausmą?
Nuovargio neliko ○ X ○ ○ ○ Nebuvo poveikio nuovargiui
Komentaras

4. Kiek procedūrų metu sumažėjo įtampa, nerimas, streso buvimas?
Ryškiai sumažėjo ○ ○ X ○ ○ Poveikio nebuvo
Komentaras:

5. Kaip pasikeitė jūsų nuotaika?
Ryškiai pagerėjo ○ X ○ ○ ○ Nepasikeitė
Komentaras:

6. Kaip pasikeitė raumenų jėga?
Didesnė jėga, tonusas ○ ○ X ○ ○ Nepasikeitė
Komentaras:

7. Kaip pasikeitė skausmo pojūtis (sąnariuose, nugaroje, galvos, pilvo ar kt.)?
Išnyko ○ ○ X ○ ○ Nepasikeitė/pablogėjo
Komentaras:

8. Kokius neišvardintus pasikeitimus savo organizme pajutote?

.....

.....

9. Ar patartumėte šias procedūras taikyti reabilitacijai?
Taip, būtų labai naudingos visiems X ○ ○ ○ ○ Ne
10. Jūsų pastabos

.....

.....

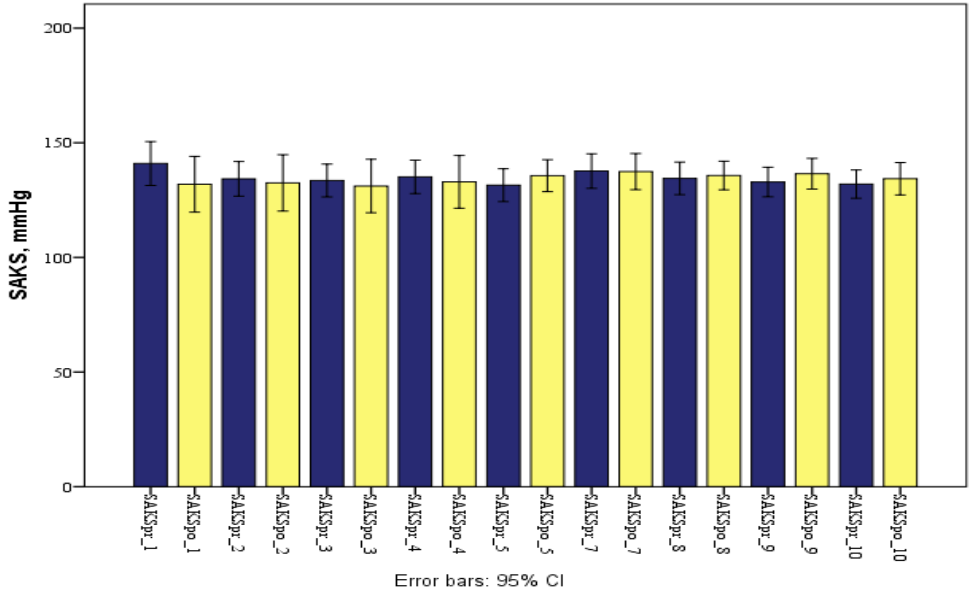
Ačiū už nuomonę ir bendradarbiavimą bei linkime sveikatos! *I.Rapolienė*

Rezultatai

Kraujospūdžio kitimas procedūros metu

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	DAKSpr_1 - DAKSpo_1	1.836	7.544	1.017	-.203	3.876	1.805	54	.077
Pair 2	DAKSpr_2 - DAKSpo_2	1.418	6.671	.900	-.385	3.222	1.577	54	.121
Pair 3	DAKSpr_3 - DAKSpo_3	-1.909	7.349	.991	-3.896	.078	-1.927	54	.059
Pair 4	DAKSpr_4 - DAKSpo_4	.200	6.772	.913	-1.631	2.031	.219	54	.827
Pair 5	DAKSpr_5 - DAKSpo_5	.945	7.070	.953	-.966	2.857	.992	54	.326
Pair 6	DAKSpr_6 - DAKSpo_6	.255	5.285	.713	-1.174	1.683	.357	54	.722
Pair 7	DAKSpr_7 - DAKSpo_7	-.444	6.608	.985	-2.430	1.541	-.451	44	.654
Pair 8	DAKSpr_8 - DAKSpo_8	-.667	6.918	1.108	-2.909	1.576	-.602	38	.551
Pair 9	DAKSpr_9 - DAKSpo_9	-1.176	5.430	.931	-3.071	.718	-1.263	33	.215
Pair 10	DAKSpr_10 - DAKSpo_10	-1.190	4.179	.912	-3.093	.712	-1.306	20	.207



Sistolinis ir diastolinis kraujo spaudimas kito individualiai, daugumoje statistiškai reikšmingo pokyčio nestebėta

Širdies susitraukimų dažnio kitimas procedūros metu

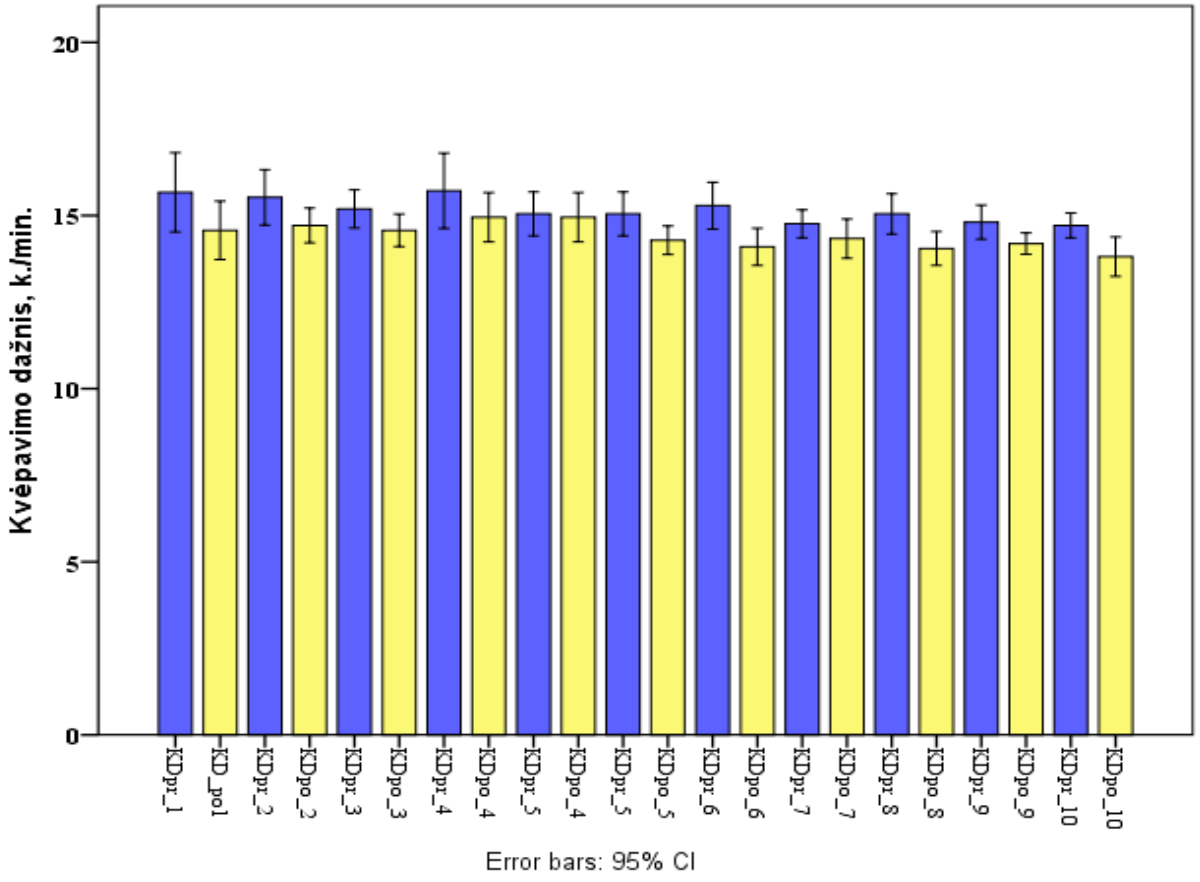
Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	ŠSDpr_1 - ŠSDpo_1	4.000	7.909	1.066	1.862	6.138	3.751	54	.000
Pair 2	ŠSDpr_2 - ŠSDpo_2	2.400	7.475	1.008	.379	4.421	2.381	54	.021
Pair 3	ŠSDpr_3 - ŠSDpo_3	1.964	8.711	1.175	-.391	4.319	1.672	54	.100
Pair 4	ŠSDpr_4 - ŠSDpo_4	3.018	6.419	.866	1.283	4.753	3.487	54	.001
Pair 5	ŠSDpr_5 - ŠSDpo_5	2.400	6.405	.864	.669	4.131	2.779	54	.007
Pair 6	ŠSDpr_6 - ŠSDpo_6	3.545	6.517	.879	1.784	5.307	4.034	54	.000
Pair 7	ŠSDpr_7 - ŠSDpo_7	-.289	6.927	1.033	-2.370	1.792	-.280	44	.781
Pair 8	ŠSDpr_8 - ŠSDpo_8	.103	6.688	1.071	-2.065	2.270	.096	38	.924
Pair 9	ŠSDpr_9 - ŠSDpo_9	.294	6.279	1.077	-1.897	2.485	.273	33	.786
Pair 10	ŠSDpr_10 - ŠSDpo_10	1.286	6.141	1.340	-1.510	4.081	.959	20	.349

Širdies susitraukimų dažnis pirmoje kurso pusėje statistiškai reikšmingai mažėjo

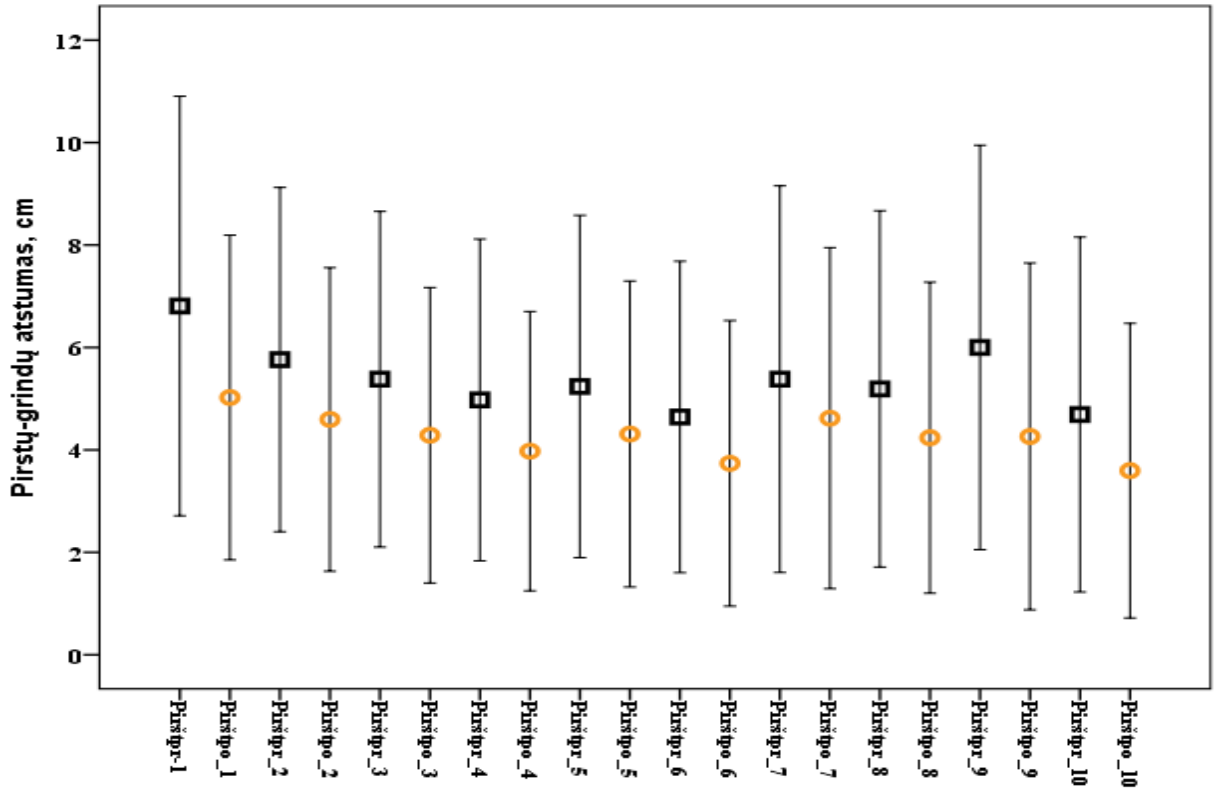
Kvėpavimo dažnio kitimas procedūros metu

Kvėpavimo dažnis statistiškai reikšmingai mažėjo



Finger-floor distance dynamics

vid. su 95proc. PI



Po procedūros
atstumas vid padidėjo 3 cm
Po kurso iki 7 cm

Visais atvejais prieš geoterminio vonią (Pr_n) ir po vonios (Po_n) vidurkių skirtumai buvo statistiškai reikšmingi ($p<0,01$).

Dalyvio būklės pokyčiai po balneoterapijos geoterminiais vandenimis kursocx

2. Lentelė. Funkcinių rodmenų kitimas balneoterapinės procedūros poveikyje.

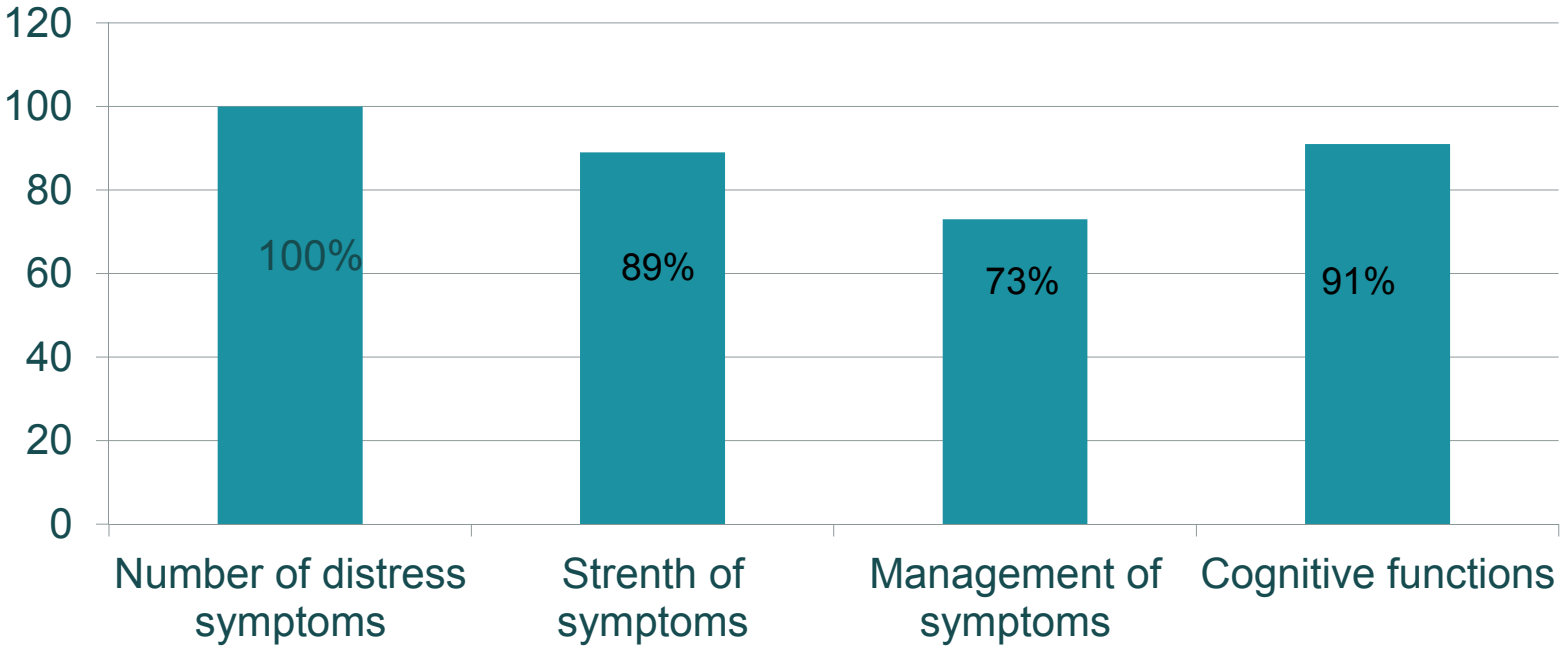
Rodmenys	Prieš (n=55) Vid. (SN)	Po (n=55) Vid. (SN)	Pokytis (n=55) Vid. (SN)	*p*-reikšmė
Kvėpavimo dažnis, k/min.	15,6 (2,0)	14,4 (0,8)	1,17 (1,85)	<0.001
Sistolinis AKS, mmHg	136,8 (21,6)	129,5 (12,8)	7,36 (16,03)	0.001
Diastolinis AKS, mmHg	83,6 (10,6)	78,0 (7,7)	5,64 (8,95)	<0.001
Širdies susitraukimų dažnis, k/min.	75,4 (8,5)	72,4 (7,9)	3,02 (7,35)	0.004
Kūno temperatūra, ^{0}C	36,6 (0,3)	36,2 (0,4)	0,40 (0,26)	<0.001
Skausmas, balas	2,2 (1,6)	1,2 (1,2)	1,00 (0,66)	<0.001
Rankos judesys, laipsnis	2,6 (0,4)	3,0 (0,4)	-0,42 (0,25)	<0.001
Bendra savijauta, balas	2,7 (0,4)	3,2 (0,4)	-0,41 (0,25)	<0.001
Nuotaika, balas	2,8 (0,4)	3,3 (0,4)	-0,55 (0,21)	<0.001
Pirštų – grindų atstumas, cm$^{\#}$	4,2 (6,9)	3,4 (6,0)	4,2 (6,9)	<0.001

Taikytas porinis Stjudento testas;

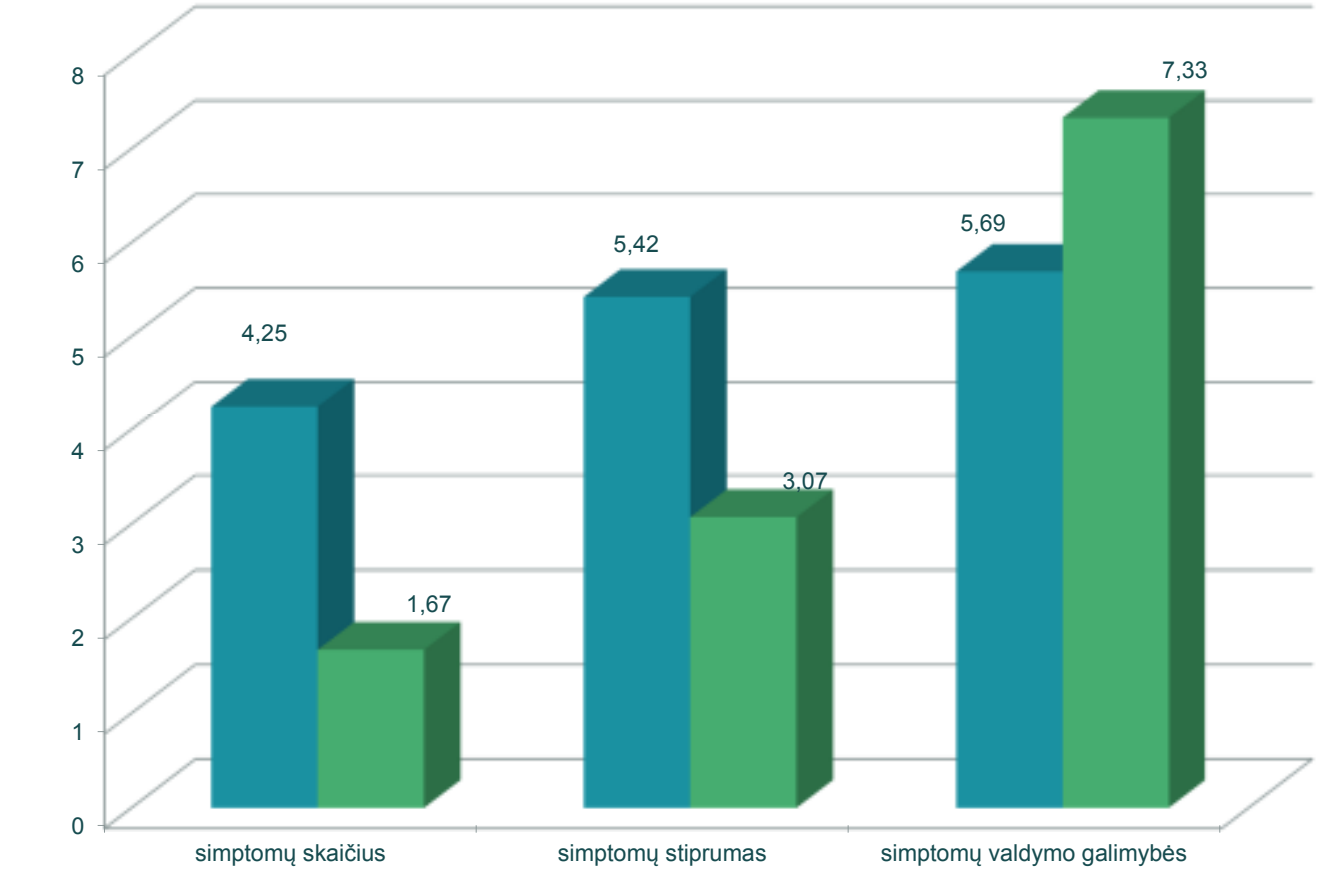
$^{\#}$ Taikytas Vilkoksono testas.

Pain (VAS)

Effect of balneotherapy procedures on status psychoneurological status



The General Symptom Distress Scale
comparison before and after treatment



Before baths
After baths

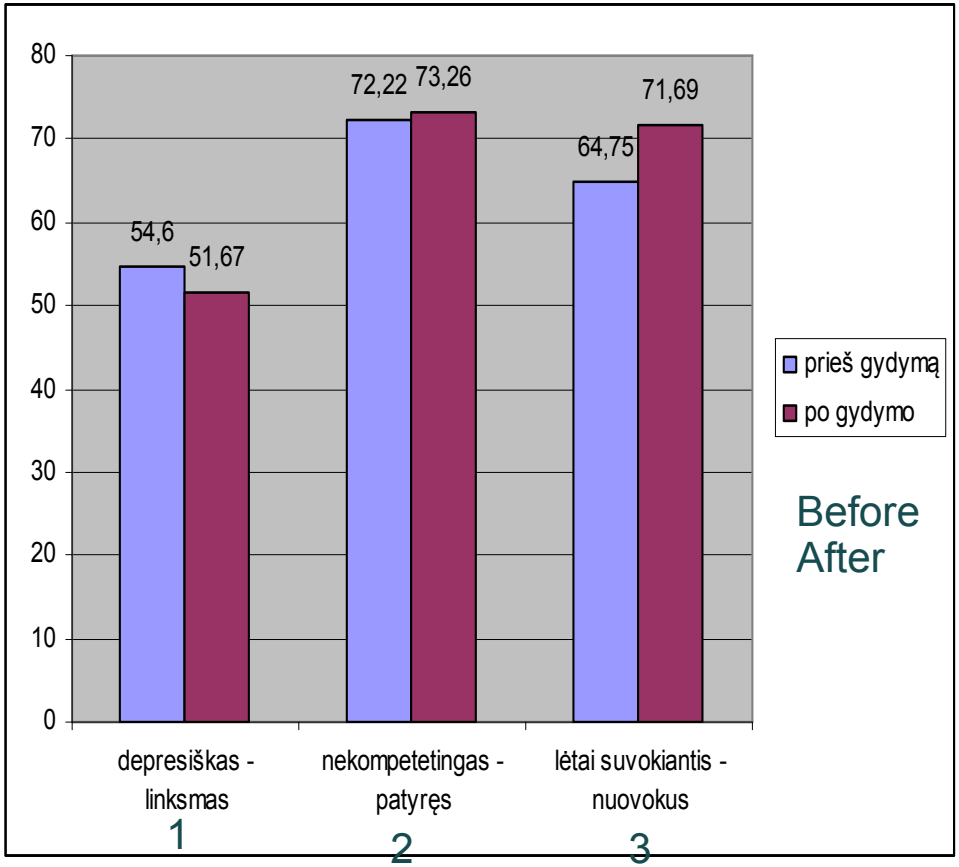
Total number of symptoms Symptom distress Symptom management

p <0,0001

Mood changes after balneotherapy (1)

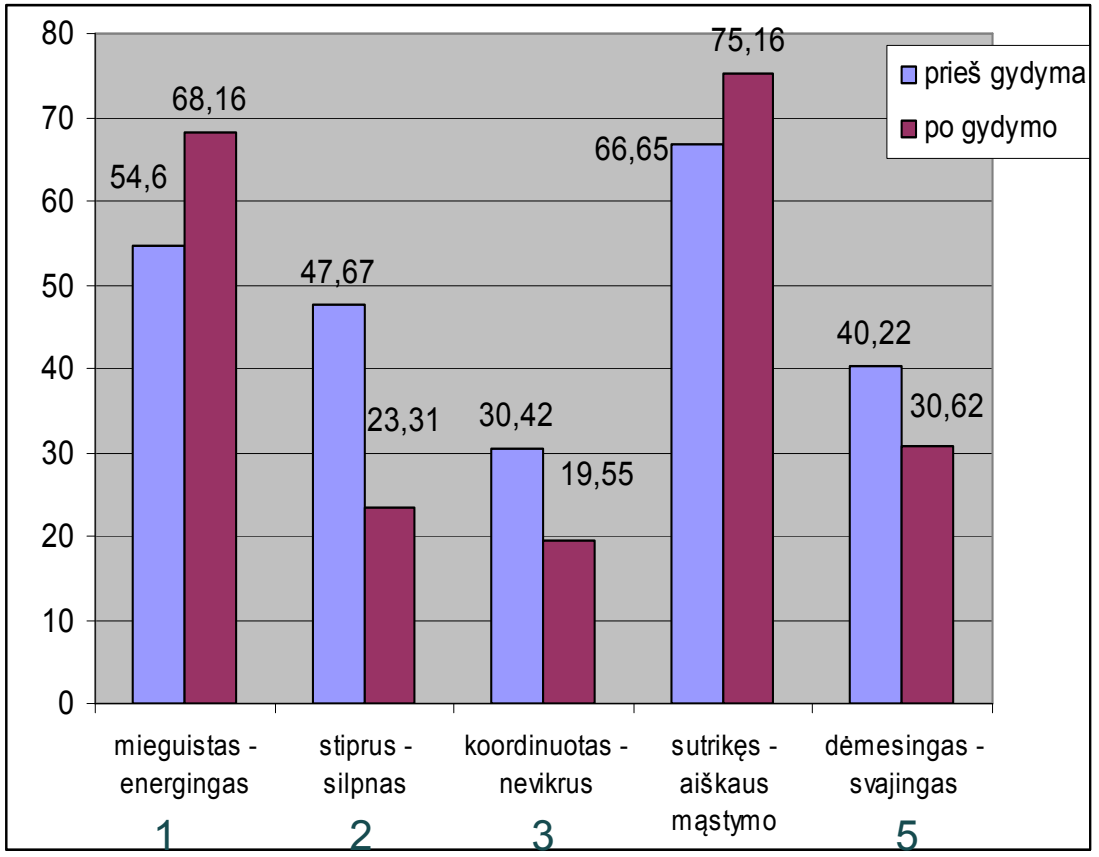
- Geothermal water procedures affect mood in terms terms:
- No changes were observed in: Happy-sad ; antagonistic - friendly, self-centried – outward-going
- Slight change was observed in **depressed-elated,**
- **incompetent-proficient**
- **mentally slow- quick-witted**, but it considered statistically insignificant

1- p = 0.397 (> 0.05)
2- p = 0.754, (> 0.05)
3- p = 0.064, (> 0.05)



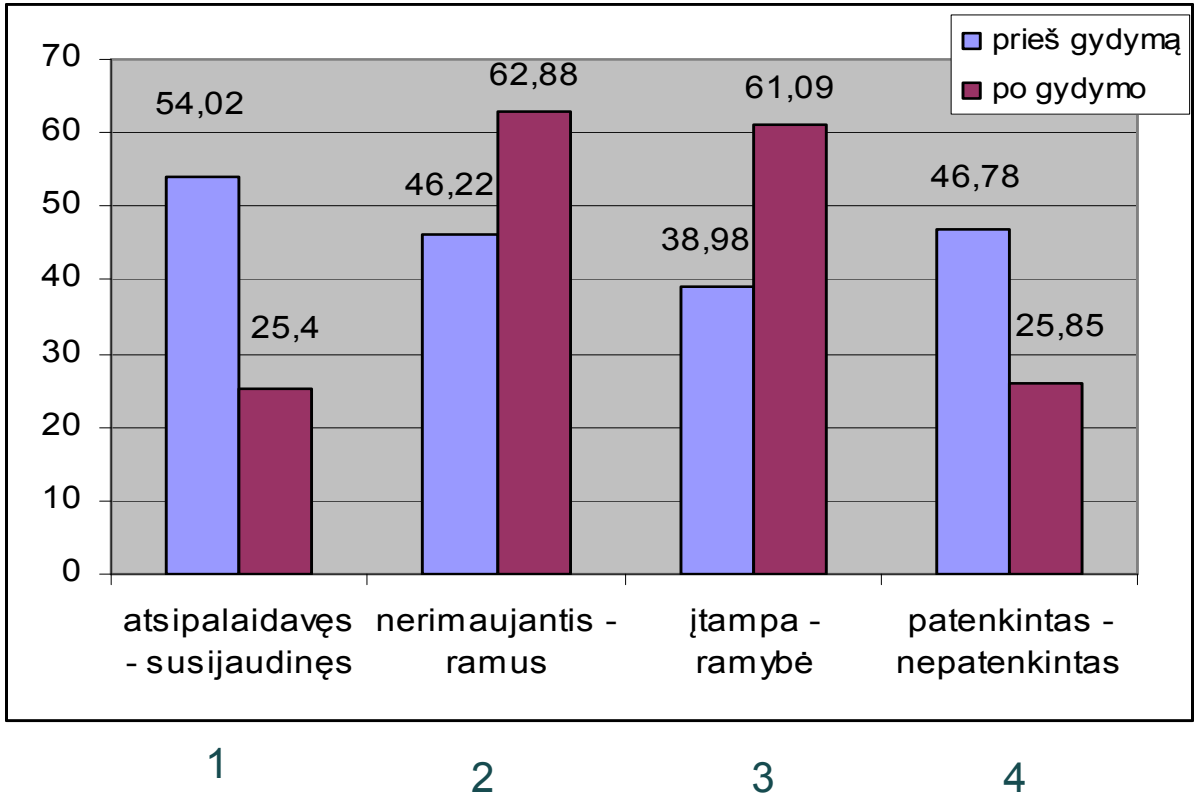
Mood changes after balneotherapy (2)

- After procedures participants felt more
- **energetic (1),**
- **stronger (2),**
- **more coordinated (3),**
- **clear-headed** (4)
- **attentive (5),** than before treatment.
- The difference was statistically significant ($p < 0.05$).

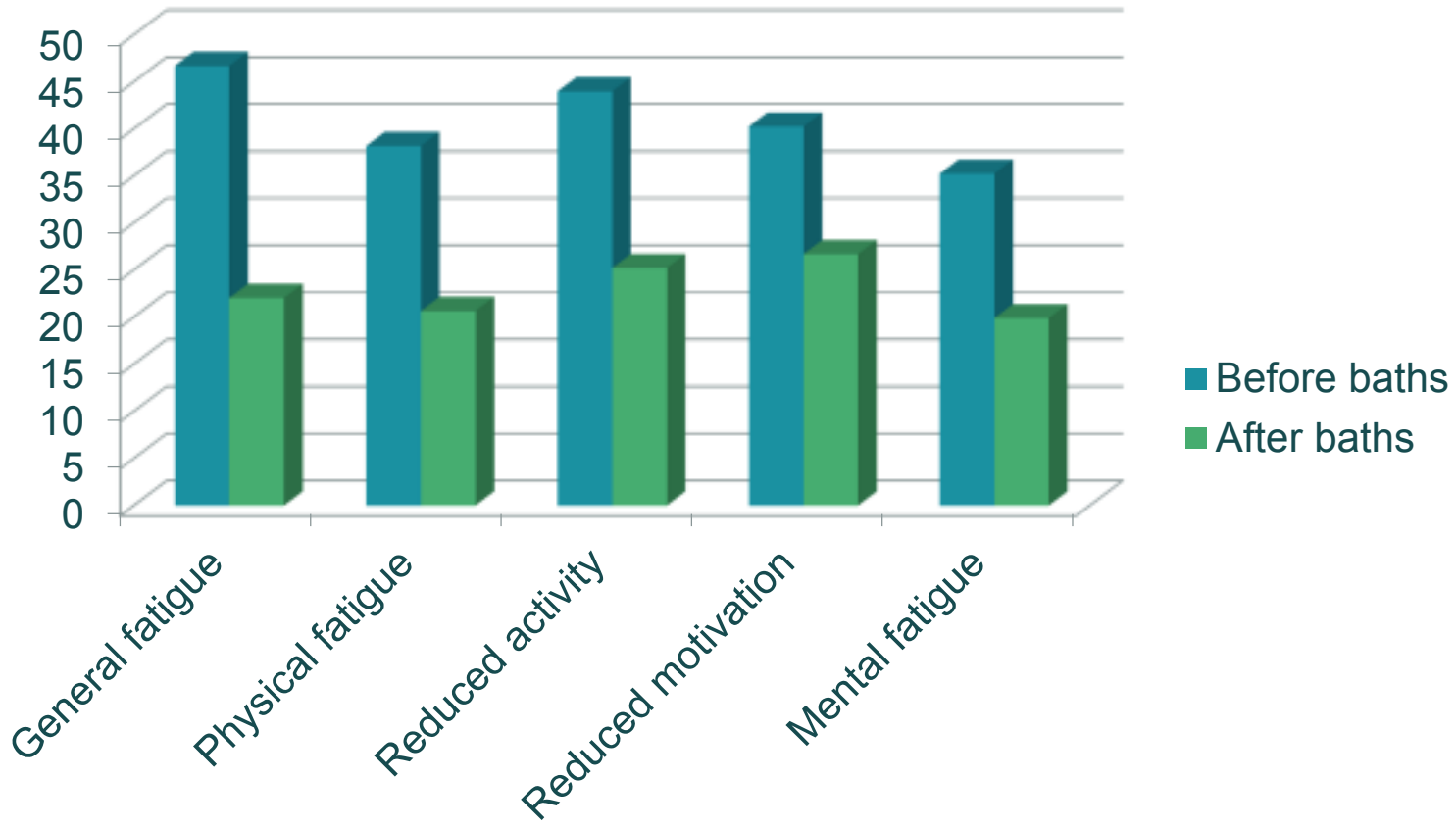


Mood changes after balneotherapy (3)

- Particularly significant mood has changed for the better in these scale components:
- **relaxed - excited**;
- **troubled-tranquil,**
- **tense – calm** ,
- **contented-discontented.**
- The differences were statistically significant, p <0.0001.

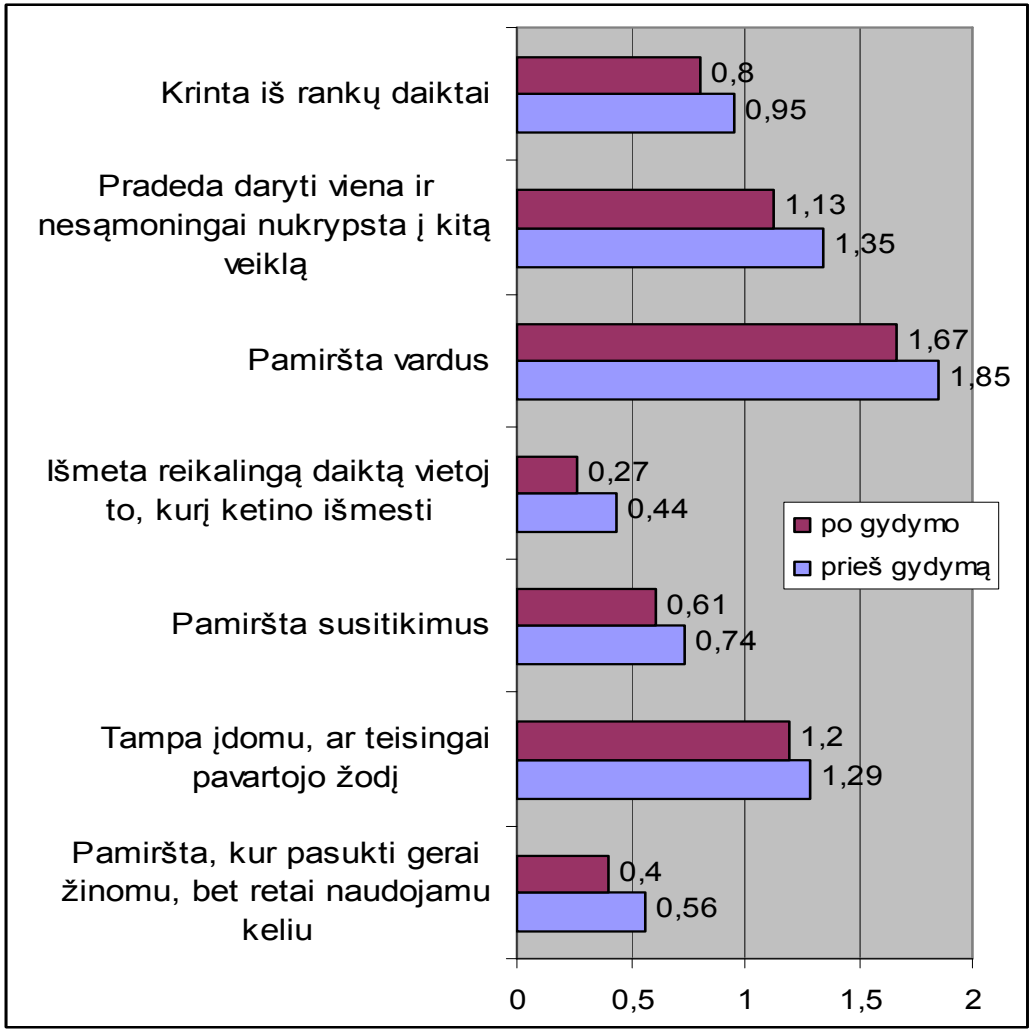


Fatigue


50
45
40
35
30
25
20
15
10
5
0
General fatigue
Physical fatigue
Reduced activity
Reduced motivation
Mental fatigue
Before baths
After baths

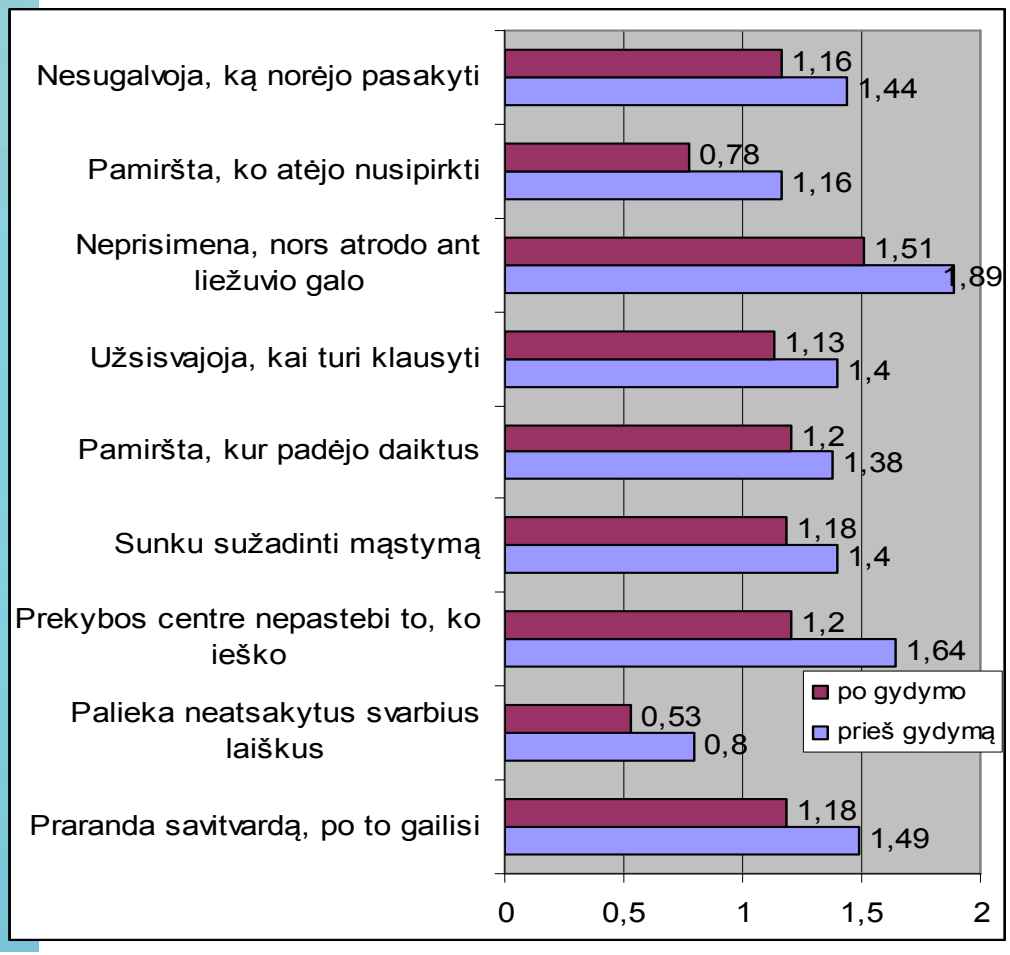
CFQ (1)

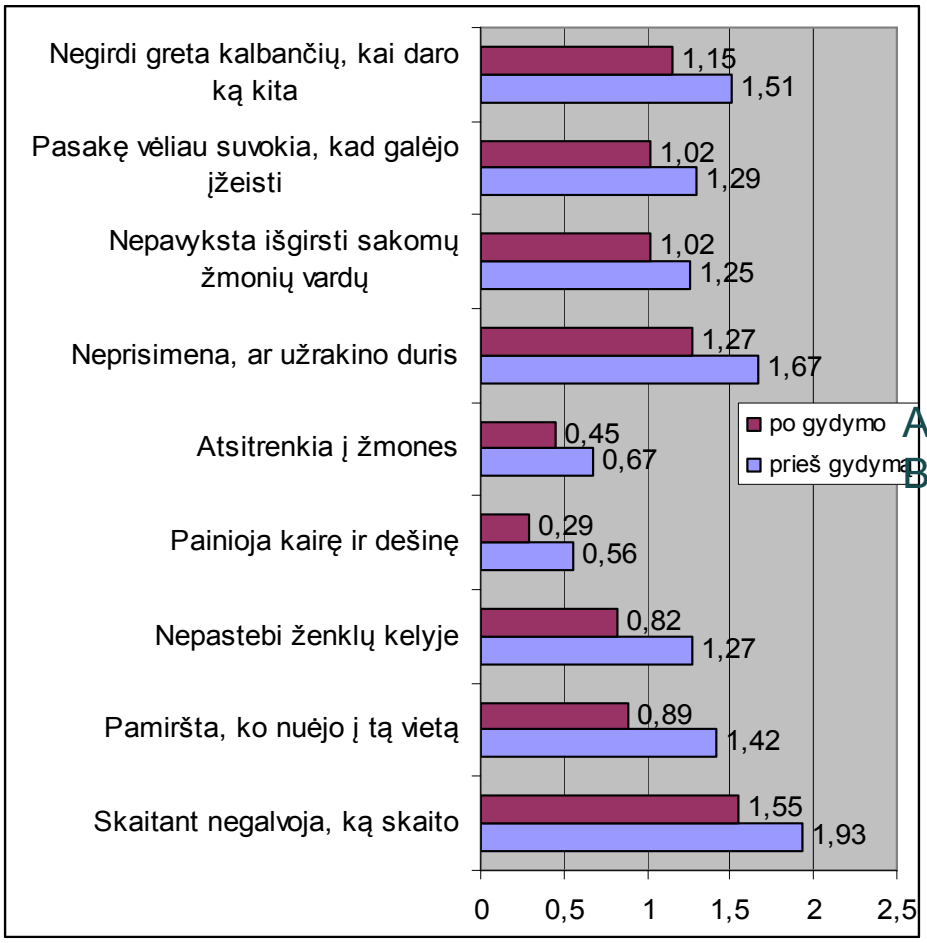
For 7 of the 25 investigated possible cognitive occurrence no significant effect, p> 0.05 (25, 21,20,18,16,14,12)



CFQ (2)

Statistically significant differences in the mean ratings before and after treatment were found in 18 of the 25 investigated possible cognitive processes abnormalities. P <0.05.

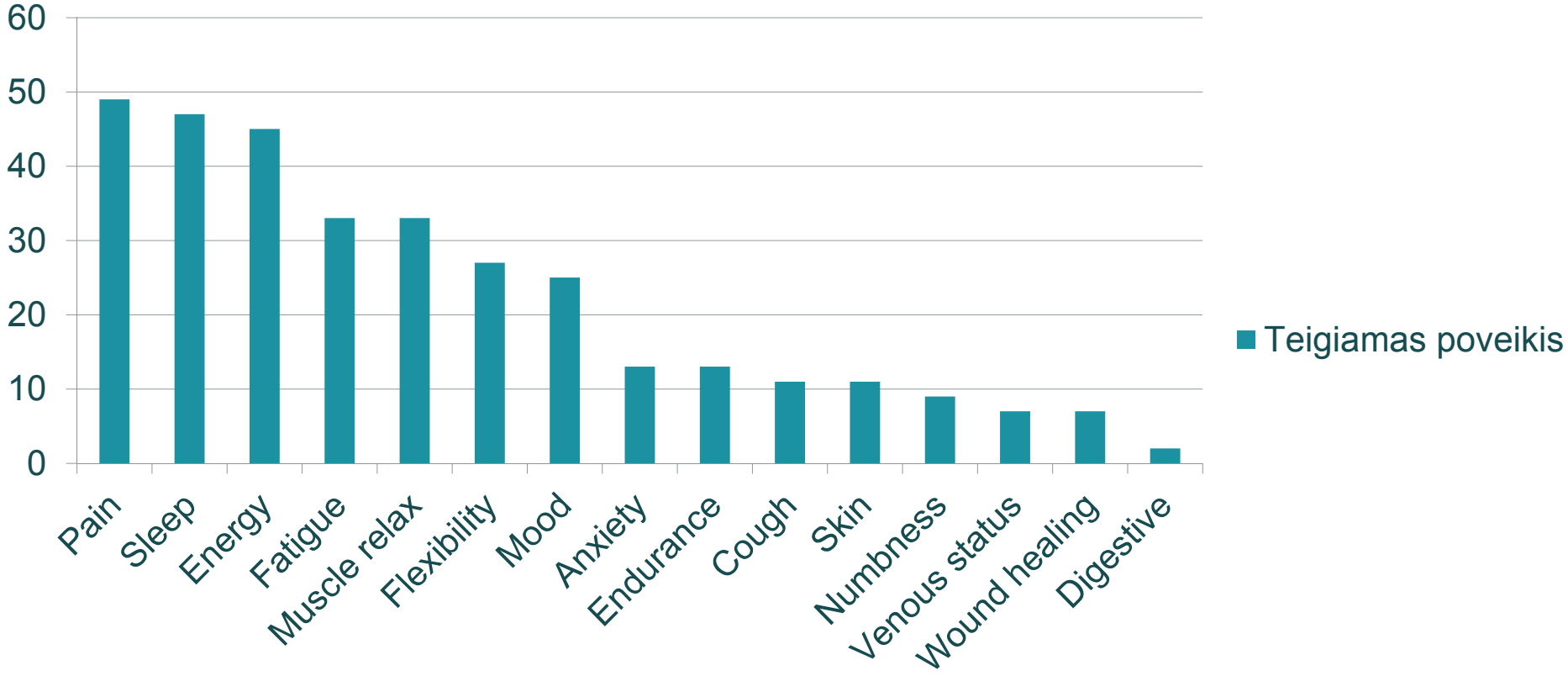




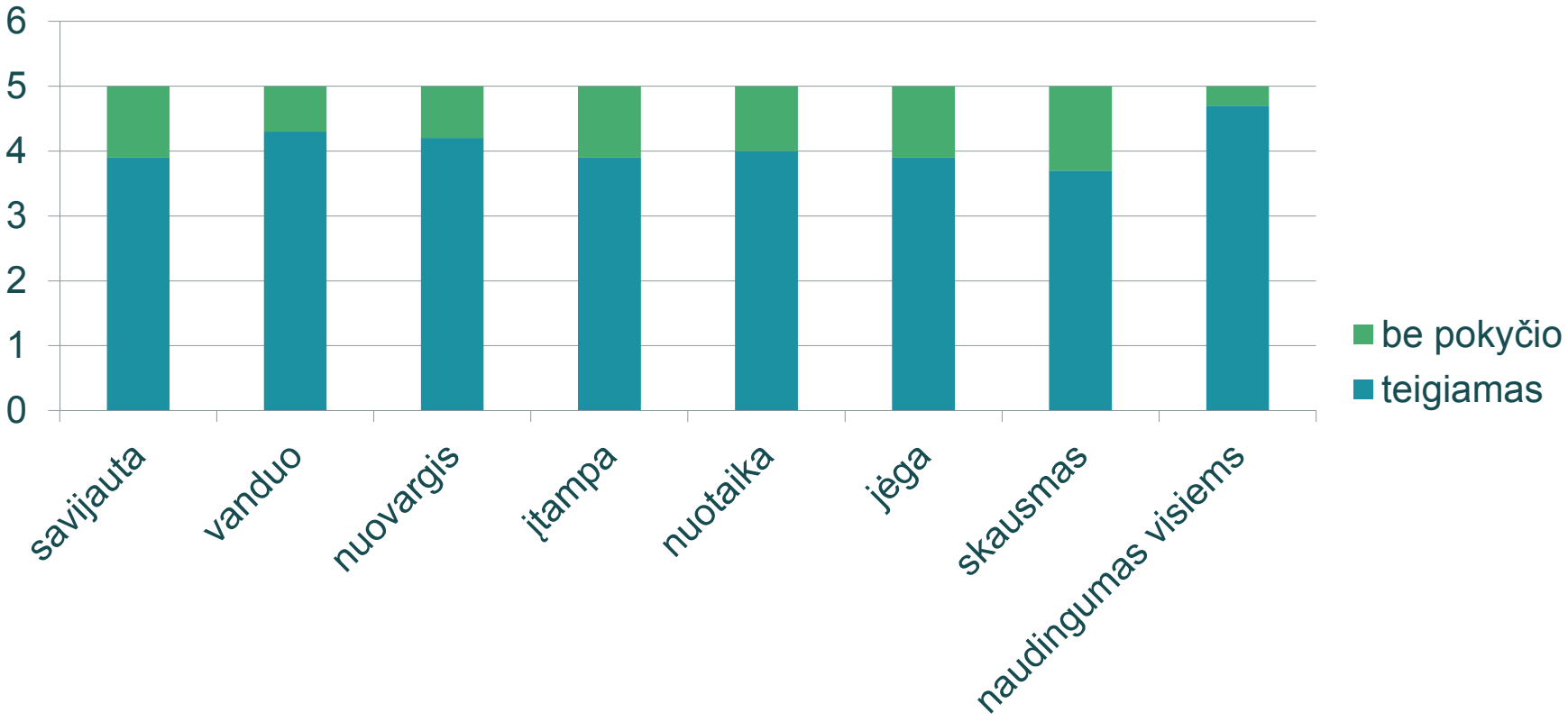
After

Before

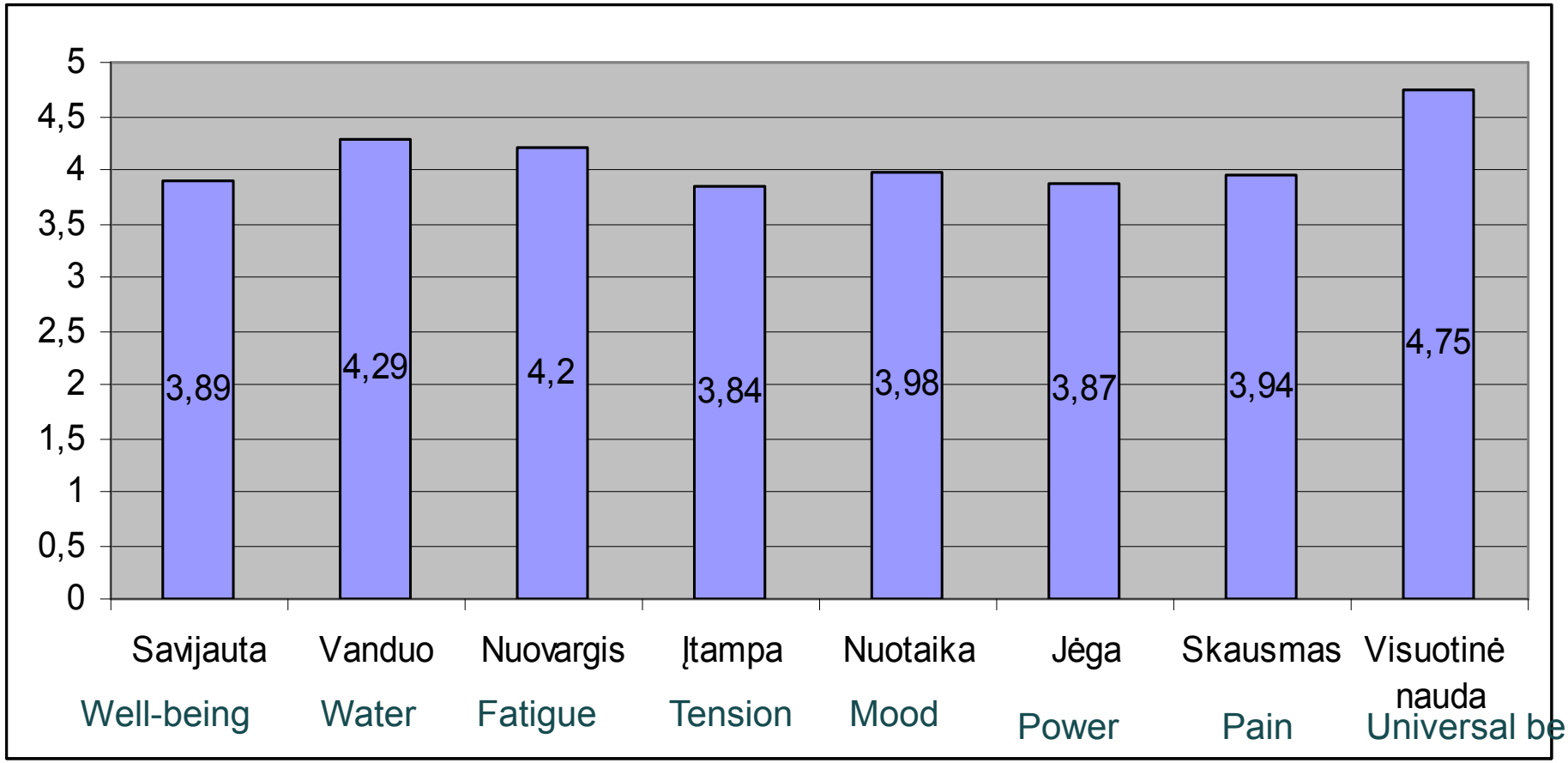
Additional positive effects noticed by participants



Bendras geoterminių vandens procedūrų vertinimas



Geothermal water bath impacts assessment



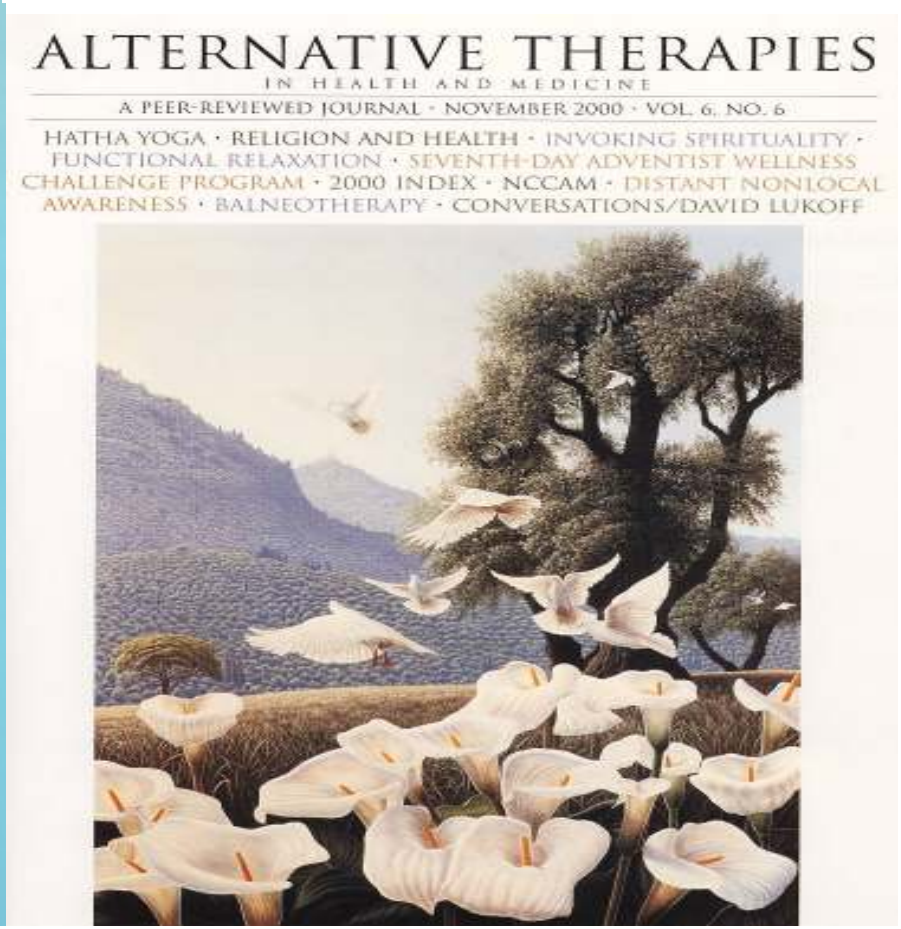
Almost all the components of five-point scale is close to the Quartet
General evaluating of procedures efficiency was as high as 4.75.

Conclusions

1. Influence of geothermal water bathing courses of 6-10 procedures on physiological test data changes: a statistically significant reduction of respiratory and heart rate, decreased of SBP and DBP.
2. Geothermal water baths improved the participats well-being, decreased pain, increased muscle strength, and mood, improved sleep.
3. Balneotheraphy treatment influenced better spinal mobility and increased joint range of motion.
4. Treatment with geothermal waters improved psychoemotional state of the participants.
5. Balneotherapy using geothermal water is a valuable treatment/prophylaxis of various diseases, and the good addition of rehabilitation plan.
6. Geothermal water gives positive effect on many systems of the human body, and is safe. This resource could be more widely used for improving health in rehabilitation and balneorecreational centers.
7. However, it is needed further well designed randomized controlled trials with a higher number of patients and duration of positive effects measurement.

THE EFFECT OF BALNEOTHERAPY ON AMBULATORY BLOOD PRESSURE

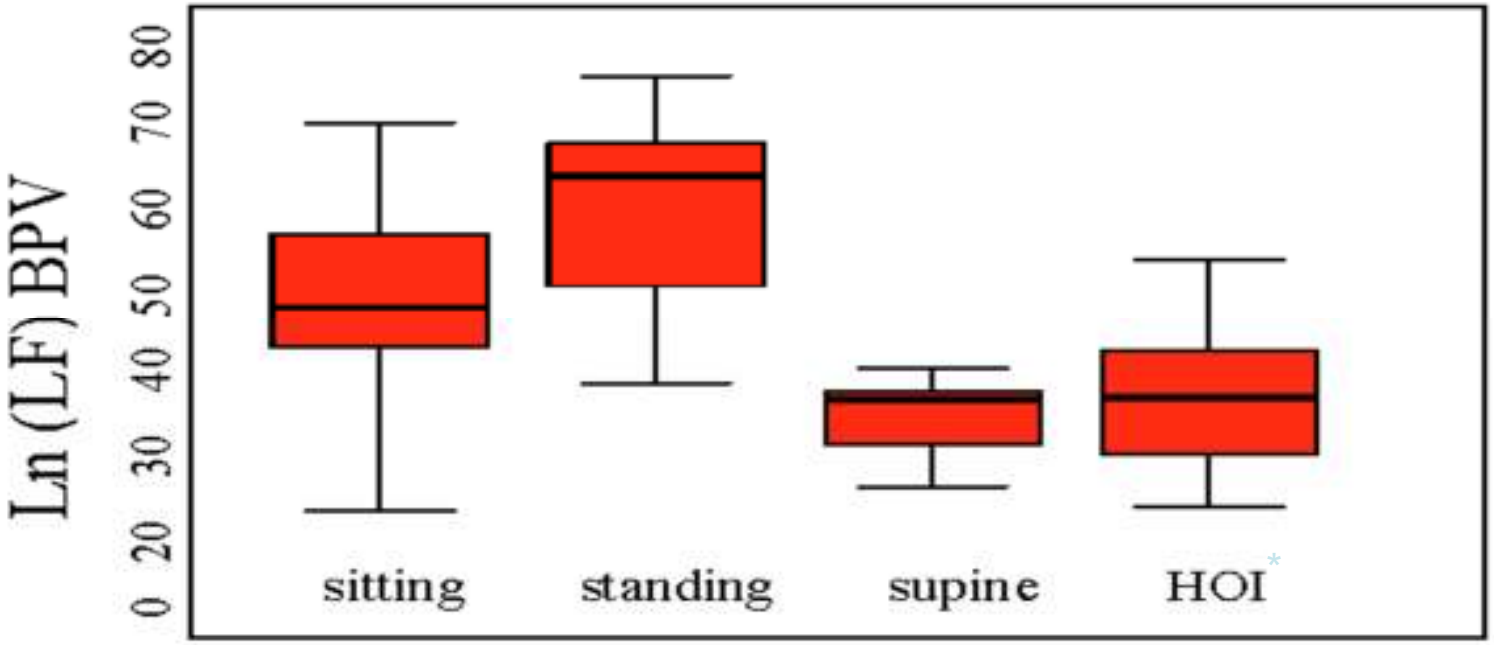
Cem Ekmekcioglu, MD, Gerhard Strauss-Blasche, PhD, Josef Feyertag, MD, Norbert Klammer, DI, and Wolfgang Marktl, MD



A 3 week spa therapy lead to a decrease in 24-BP especially in patients with medium-high initial values
A clear improvement in circadian variation variables was detected in patients with high BP.
Mechanisms:

- CO_2-baths ? + (?)
- Physiological Adaptation ? + (?)
- Recovery from chronic stress ? (?)

Heart Rate Variability: Effect of Head Out Water Immersion (HOWI)



Bart V et al. J Gravit Physiol 2003;

*sitting in thermoneutral water

J. Phys. Ther. Sci.
25: 109–112, 2013

21-day Balneotherapy Improves Cardiopulmonary Function and Physical Capacity of Pilots

Li Xi[1,2], Runze Shi[3], Bing Wang[4], Jie Geng[2], Linfu Zhou[1], Yugang Zhang[3], Guanghui Guo[1], Jingzao Chen[2], Xinsheng Cao[2], Shu Zhang[4]

[1] *Department of Medical Affairs, Lintong Sanatorium of Lanzhou Military Region*
[2] *Department of Aerospace Biodynamics, Fourth Military Medical University*
[3] *Department of Health, Lanzhou Military Region*
[4] *The Key Laboratory of Aerospace Medicine, Chinese Ministry of Education: Xi'an 710032, China.*
TEL: +86 29-8324-3218, E-mail: shuzhang89@hotmail.com

- Balneotherapy can increase venous return by hydrostatic pressure, and warm water immersion can also help to increase early diastolic filling, facilitating improvement in cardiac function. Several studies have suggested that balneotherapy can stimulate vascular relaxation, thereby improving vascular function and reducing peripheral vascular resistance and cardiac load.
- In study, balneotherapy decreased ICT(isovolumic contraction time) and ICT/LEVT (isovolumic contraction time/ejection time in left ventricular) indicating improvement of the left ventricular pump function. Other indicators of the left ventricular pump function, such as LEVT and PEP, showed trends of improvement in cardiac function following balneotherapy, though the differences were not significant.
- Balneotherapy was shown to provide significant and longer lasting improvement of respiratory symptoms. Three possible explanations. First, the hydrostatic pressure of the water on the chest prompted the pilots to increase their tidal volume and in turn this exercised their respiratory muscles. Second, the mineral water contains a high concentration of carbonic acid. Under the action of the carbonic acid gas in the lungs during balneotherapy, breathing becomes deeper and slower improving the ventilation function. Third, hydrostatic pressure may force the diaphragm to move further upwards, resulting in an increase in pulmonary ventilation and expiratory volume .
- In the study was altered FVC (forced vital capacity), PEF(peak respiratory flow), FEF 25-75% (forced expiratory flow)I and FEV1/FVC(forced expiratory volume in 1s)

Balneotherapy and Spa Therapy of Rheumatic Diseases in Turkey: A Systematic Review
M.Z. Karagülle, M. Karagülle
Research in Complementary and Classical Natural Medicine
2004;11:33-41

Forschende Komplementärmedizin und Klassische Naturheilkunde

Übersichtsarbeit · Review Article

Forsch Komplementärmed Klass Naturheilkd 2004;11:33–41

Balneotherapie und Kurorttherapie rheumatischer Erkrankungen in der Türkei: Ein systematischer Review

M.Z. Karagülle M. Karagülle

Medizinische Ökologie und Hydroklimatologie, Medizinische Fakultät Istanbul der Universität Istanbul

- The effectiveness and efficacy of different balneo-hydrological and spa therapies in Turkish spas for treating rheumatic diseases
  - Osteoarthritis
  - Rheumatoid arthritis
  - Fibromyalgia
  - Ankylosing spondylitis and
  - Low back pain
  - Psoriatic arthritis

Rheumatology 2006;45:880–884
Advance Access publication 31 January 2006
doi:10.1093/rheumatology/kel018

Spa therapy and balneotherapy for treating low back pain: meta-analysis of randomized trials

M. H. Pittler, M. Z. Karagülle[1], M. Karagülle[1] and E. Ernst

Clin Rheumatol (2007) 26:2063–2071
DOI 10.1007/s10067-007-0618-x

ORIGINAL ARTICLE

A 10-day course of SPA therapy is beneficial for people with severe knee osteoarthritis

A 24-week randomised, controlled pilot study

Mine Karagülle · Müfit Zeki Karagülle ·
Oğuz Karagülle · Arif Dönmez · Mustafa Turan

Rheumatology 2009;48:1155–1159
Advance Access publication 16 July 2009
doi:10.1093/rheumatology/kep182

Concise Report

Efficacy of hydrotherapy in fibromyalgia syndrome—a meta-analysis of randomized controlled clinical trials

Jost Langhorst[1], Frauke Musial[1], Petra Klose[1] and Winfried Häuser[2,3]

Clin Rheumatol
DOI 10.1007/s10067-009-1114-2

REVIEW ARTICLE

Short- and long-term therapeutic effects of thermal mineral waters in knee osteoarthritis: a systematic review of randomized controlled trials

Taoufik Harzy · Najoua Ghani · Nessrine Akasbi · Wafaa Bono · Chakib Nejjari

Int J Biometeorol
DOI 10.1007/s00484-013-0667-6

REVIEW PAPER

Evidence-based hydro- and balneotherapy in Hungary—a systematic review and meta-analysis

T. Bender · G. Bálint · Z. Prohászka · P. Géher · I. K. Tefner

Received: 25 December 2012 / Revised: 21 March 2013 / Accepted: 31 March 2013

Abstract Balneotherapy is appreciated as a traditional treatment modality in medicine. Hungary is rich in thermal mineral waters. Balneotherapy has been in extensive use for centuries and its effects have been studied in detail. Here, we present a systematic review and meta-analysis of clinical trials conducted with Hungarian thermal mineral waters, the findings of which have been published by Hungarian authors in English. The 122 studies identified in different databases include 18 clinical trials. Five of these evaluated the effect of hydro- and balneotherapy on chronic low back pain, four on osteoarthritis of the knee, and two on osteoarthritis of the hand. One of the remaining seven trials evaluated balneotherapy in chronic inflammatory pelvic diseases, while six studies explored its effect on various laboratory parameters. Out of the 18 studies, 9 met the predefined criteria for meta-analysis. The results confirmed the beneficial effect of balneotherapy on pain with weight bearing and at rest in patients with degenerative joint and spinal diseases. A similar effect has been found in chronic pelvic inflammatory disease. The review also revealed that balneotherapy has some beneficial
status, and on metabolic and infl
Based on the results, we conclude t
Hungarian thermal-mineral waters is
lower back pain, as well as for knee

Conclusion

Our review and the meta-analysis of nine articles appear to confirm that the studied Hungarian thermal mineral waters significantly reduce pain in degenerative joint and spinal disease, as well as osteoarthritis of the hand and knee, and that they also alleviate chronic low back pain.

Balneotherapy for osteoarthritis (Review) 2007

Verhagen AP, Bierma-Zeinstra SMA, Boers M, Cardoso JR, Lambeck J, de Bie RA, de Vet HCW

Balneotherapy for rheumatoid arthritis (Review) 2004

Verhagen AP, Bierma-Zeinstra SMA, Cardoso JR, de Bie RA, Boers M, de Vet HCW

THE COCHRANE COLLABORATION®

Physical Therapy Reviews 2002; **7**: 209–222

EFFICACY OF BALNEOTHERAPY FOR OSTEOARTHRITIS OF THE KNEE: A SYSTEMATIC REVIEW

LUCIE BROSSEAU*, LYNN MACLEAY*, VIVIAN ROBINSON†, LYNN CASIMIRO*, LUCIE PELLAND*, GEORGE WELLS, PETER TUGWELL† and JESSIE MCGOWAN†

**School of Rehabilitation Sciences, University of Ottawa, Canada*
†Institute of Population Health, University of Ottawa, Canada
‡Department of Epidemiology and Community Medicine, University of Ottawa, Canada

Physical Therapy Reviews 2002; **7**: 67–87

EFFICACY OF BALNEOTHERAPY FOR RHEUMATOID ARTHRITIS: A META-ANALYSIS

LUCIE BROSSEAU*, VIVIAN ROBINSON†, GUILLAUME LÉONARD*, LYNN CASIMIRO*, LUCIE PELLAND*, GEORGE WELLS‡ and PETER TUGWELL†

**School of Rehabilitation Sciences, †Institute of Population Health, and ‡Department of Epidemiology and Community Medicine, University of Ottawa, Ontario, Canada*

META-ANALYSIS

THE INTERNATIONAL JOURNAL OF CLINICAL PRACTICE

The therapeutic effect of balneotherapy: evaluation of the evidence from randomised controlled trials

M. E. Falagas,[1,2] E. Zarkadoulia,[1†] P. I. Rafailidis[1]

[1]Alfa Institute of Biomedical Sciences (AIBS), Athens, Greece
[2]Department of Medicine, Tufts University School of Medicine, Boston, MA, USA

Int J Clin Pract, July 2009, **63**, 7, 1068–1084

Message for the Clinic

The available evidence suggests that balneotherapy may help patients with various rheumatologic diseases;

- Osteoarthritis
- Fibromyalgia
- Ankylosing Spondylitis
- Rheumatoid arthritis
- Chronic low back pain

Message for future research

More evidence is needed for he effectiveness of balneotherapy in other diseases such as;

- Dermatological
- Cardiovascular
- Respiratory
- Gastrointestinal
- Allergic
- Gynecological

We have a long way to go

- in search of reaching a comprehensive understanding of the ways and mechanisms
- how the biomarkers, cytokines, hormones and other mediators of inflammation and immune system and oxidative stress and anti-oxidation status are involved, the roles they play in the effectiveness of spa and balneotherapy
- Well designed clinical trials for separate diseases with standardized objective measures and outcomes, proper number of participants, longer duration and blindness.

SPAC list

H. Kamioka, Y. Kawamura ir kt.
Delphi consensus method
2013

Table 3 Final checklist of items for interventional trials based on spa therapy: the SPAC checklist.

Item no.	Section/topic	The issues which should be included (descriptor)	Reported on page no.
1	Title	Identification as a spa intervention in the title	
2	Introduction	Description of why do spa intervention	
3	Method; place of implementation	Explanation of spa suitable for intervention as health enhancement	
4	Method; place of implementation	Locations of spa facility where the data were collected (location and surrounding environment)	
5	Method; place of implementation	Bathtub temperature	
6	Method; place of implementation	pH	
7	Method; place of implementation	Chemical and thermal characteristics of spa	
8	Method; place of implementation	Scale of bathtub	
9	Method; place of implementation	Presence of facilities (if any, the property; e.g., comfortable resting room, etc.)	
10	Method; place of implementation	(When applicable) existence of other exposure than bathing (sauna, steam bath, etc.)	
11	Method; care providers	Qualification of care provider (specialist in balneotherapy, related experts and health fitness programmer, etc.)	
12	Method; care providers	Experience of care provider	
13	Method; intervention	Information about the intervention subject (e.g., public health service of administration, research group, etc.)	
14	Method; intervention	Details of the contents of bathing instruction (including bath time, frequency in use and period)	
15	Method; intervention	When combined with a method other than bathing (exercise, meals, or drinkable spa, etc.), detail of the contents	
16	Method; intervention	Instructions about daily life (the same as usual, increase the step number a day as much as possible, etc.)	
17	Method; intervention	Details of how to deal with the control group	
18	Result: participant flow	Number and detail reason of dropout	
19	Results: anciliary analysis	Adherence (the frequency and rate of actual implementation)	

Lot of other possibilities to use geothermal water for medicine purposes

The forces of nature to human health. Use it or lose it?