

KU LEUVEN

AQUA-LEUVEN 2015

April 15-18, 2015



Title:

Abstracts Book of the Second European Conference on Evidence Based Aquatic Therapy,
AQUA-LEUVEN 2015

Editor:

Daniel Daly

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KU Leuven, Faculty of Kinesiology and Rehabilitation Sciences

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Reviewer:

Susana Maria Soares Ribeiro, Faculty of Sports, University of Porto

Leuven, Belgium, 2015

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Welcome messages

Welcome from the Dean of the Faculty of Kinesiology and Rehabilitation Sciences: KU Leuven

In the name of the Faculty of Kinesiology and Rehabilitation Sciences of the KU Leuven I want to welcome you to AquaLeuven. You are visiting one of the oldest Universities in the world, founded in 1425. We are a research intensive University with 16 faculties organized in 3 groups: *Humanities & Social Sciences*, *Biomedical Sciences* and *Science, Engineering & Technology*. Presently we have about 55,000 students in Leuven. In our Faculty we have more than 2400 students in Bachelor, Master and PhD programs. To achieve our mission we rely on more than 100 highly motivated and qualified academic colleagues. Our educational programs are the disseminators of the scientific knowledge generated within the domain of 'human movement' and 'moving humans'. We offer two bachelor programs (Ba in Physical Education and Kinesiology, and Ba in Rehabilitation Sciences and Physiotherapy) and three master programs (Master of Physical Education and Kinesiology, Master of Rehabilitation Sciences and Physiotherapy and an International Master in Adapted Physical Activity). We also have programs in Sports Medicine and Occupational Therapy.

During the last few decades our research effort has also experienced strong growth, led by two research departments, each generating a considerable scientific output in highly rated journals. The Faculty of Kinesiology and Rehabilitation Sciences at the KU Leuven strongly believes in the benefits of international cooperation. We want to pursue this scientific track, not in the least by attracting students and researchers from abroad to spend varying time in our laboratories.

Our faculty is located at the FaBeR-campus, where state-of-the-art sports facilities are embedded in the beautiful green environment of the Arenberg park which you are experiencing. Housing in the park provides the perfect mix for students and scholars from Belgium or abroad to study and live in an open and friendly community atmosphere. We hope you enjoy your stay in Leuven and that this will lead you to new ideas as well as friendships.



Welcome from the Organizers,

In the name of the organization of AquaLeuven 2015 we want to welcome you to the second European conference on evidence based aquatic therapy. Aquatic therapy and physical activity in water in general are extremely popular and we all think that it is effective and even more effective than other forms of therapy. We are here to examine and test this hypothesis. We have about 140 participants from all parts of the world and as far away as New Zealand. There are 7 keynote speakers, 34 podium presentations, 38 poster presentations as well as workshops and pool demonstrations. These include all aspects of aquatic therapy and physical activity in water covering therapeutic applications in several populations as well as learning to swim and the therapeutic potential of performance and competition swimming. The topics are diverse. We will also examine new topics such as the awareness of aquatic therapy as a potential intervention and this in several settings. We have a full program but we hope there will be sufficient opportunities to interact with old as well as new friends and colleagues.

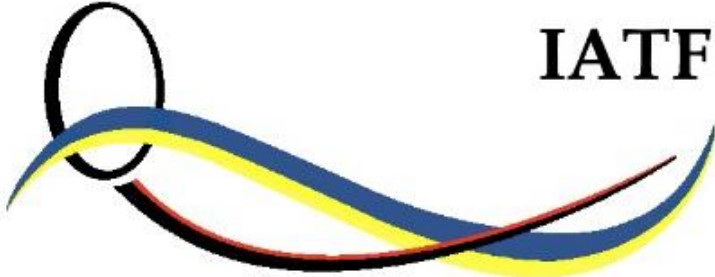
We also want to take the time to thank everyone who helped to make this organization possible. First of all our University and the Faculty of Kinesiology and Rehabilitation Science has provided us with superb facilities and assistance to organize this conference. EWAC Medical has backed us from the beginning. Without Eric Legdeur and his crew there would be no AquaLeuven. You will see some of this in your congress bag and especially at the pool demo on Saturday. The Science Foundation Flanders has also provided financial support. We want to thank our colleagues at the University of Gent, The Free University of Brussels and the Université catholique de Louvain for their help here. The city of Leuven will offer you the opening reception in our beautiful City Hall.

We are especially proud to have the IATF as a partner. They are making an important contribution by sponsoring the congress bags and especially looking to the future by presenting the young investigator award. Their expertise will also be demonstrated on Saturday morning.

We want to thank the keynote speakers for taking time from their busy schedules to come to Leuven to share their knowledge with you all. The scientific committee took the time to carefully read all abstracts without personal gain. We particularly want to recognize all participants who will make presentations either podium or poster. The success of a meeting depends a many things but most of all on the quality of the work presented. I really want to acknowledge all participants whoever you may be. We invite you to interact and hope this will be days that you will not forget soon.

And finally we are very grateful to Susana Maria Soares Ribeiro from the University of Porto who did the largest part of setting this book. Her experience and hard work we will never forget.

Sponsors



Committees

Scientific committee

- Alice Nieuwboer - KU Leuven
- Anna Ogonowska-Słodownik - Józef Piłsudski Univ. of Physical Education, Warsaw, Poland
- Antonio Cuesta-Vargas - University of Malaga, Spain
- Arianne Verhagen - Erasmus Medical Centre, Rotterdam, Netherlands
- Brendan Burkett - University of the Sunshine Coast, Queensland, Australia
- Christine Van den Broeck - Universiteit Gent
- Daniel Daly - KU Leuven
- Dieter Van Assche - KU Leuven
- Eric Kerkhofs - Vrije Universiteit Brussel
- Filip Staes - KU Leuven
- Huub Toussaint - Amsterdam University of Applied Sciences, Netherlands
- Ingi Þór Einarsson - University of Iceland
- Jane Hall - Royal National Hospital for Rheumatic Diseases, Bath, UK
- Javier Gueita - King Juan Carlos University, Madrid, Spain
- Jens Bansi - Klinik Valens, Valens, Switzerland
- Johan Lambeck - KU Leuven
- Laurie Malone - Lakeshore Institute, Birmingham, Alabama, USA
- Marc Francaux - Université catholique de Louvain
- Marlies DeClerck - University of Edinburgh, UK
- Mehmet Yanardag - Anadolu University, Eskisehir, TURKEY
- Osnat Fliess-Douer - Wingate Insitute, Netanya, Israel
- Ricardo Fernandes - University of Porto, Portugal
- Rob de Bie - University of Maastricht, Netherlands
- Sophie Heywood -The Melbourne Sports Medicine Centre, Australia
- Thierry Trooster - KU Leuven
- Tinus Jongert - Dutch Paramedical Institute, Amersfoort, Netherlands
- Urs Gamper - Klinik Valens, Valens, Switzerland

Organizing committee

- Daniel Daly - Chairman: KU Leuven
- Christine Van den Broeck - Universiteit Gent
- Christophe Delecluse – Dean of the Faculty of Kinesiology and Rehabilitation Sciences (FaBeR) , KU Leuven
- Eric Kerkhofs - Vrije Universiteit Brussel
- Johan Lambeck - Program Advisor: KU Leuven
- Marc Francaux - Université catholique de Louvain
- Marilyn Guffens - Communications Officer, FaBeR, KU Leuven
- Rik Gosselink - Vice Rector for Student Affairs and Sport Policy: KU Leuven
- Sofie Claessens - Adminstrative Director, FaBeR, KU Leuven
- Stefanie Verbeeck - Conference and Events: KU Leuven

Invited speakers



Asa Cider

Sahlgrenska University Hospital, Gothenburg, Sweden

Åsa Cider works at the Institute of Neuroscience and Physiology/Physiotherapy, The Sahlgrenska Academy, University of Gothenburg, Sweden. She completed her PhD in Cardiology on: Exercise in Patients with Chronic Heart Failure with Emphasis on Peripheral Muscle Training, Hydrotherapy and Type 2 Diabetes Mellitus. She now lectures in physiotherapy 80% at Institute of Neuroscience and Physiology/Physiotherapy and works 20% as a Specialized Physiotherapist, Sahlgrenska University Hospital.

She was co-supervisor of 4 PhD students finishing between 2008-2012. Today she is main supervisor of 4 PhD students at three different institutions. Her present research topics include: Hydrotherapy in patients with chronic heart failure, Physical fitness in patients with congenital heart disease, Physical fitness in patients with obesity or migraine and Exercise in patients with Fibromyalgia.



Benjamin Waller

University of Jyväskylä, Finland

Ben Waller is a researcher at the University of Jyväskylä, Finland. He has a 13 year clinical background specializing in musculoskeletal, sports injuries and orthopedics. He established and manages the aquatic therapy service based in a sports medicine clinic in Jyväskylä, Finland. He has worked as a physiotherapist for a number of sports teams including Swimming Jyväskylä and for the Finnish Swimming Federation. He is currently researching the impact of aquatic exercise on the biochemical composition of osteoarthritic cartilage and has published a number of articles in peer reviewed journals concerning aquatic therapy. He completed his BSc (Hons) degree in physiotherapy in 2001, graduating from the University of Brighton and graduated from University of Jyväskylä in 2010 with MSc in Health Sciences.



Bruce E. Becker

Washington State University, Spokane, USA

Dr. Becker is now as Director of the National Aquatics and Sports Medicine Institute at Washington State University, pursuing physiologic research during aquatic activity.

He has been interested in fitness, conditioning and the effects of exercise on physiology, aging, and disability throughout his career. He has a major interest in aquatic rehabilitation, and is President of the American Society of Medical Hydrology. In 1997, Dr. Becker and Andrew Cole, MD co-authored the textbook *Comprehensive Aquatic Therapy*. The 2nd edition was appeared in 2002. And the, 3rd Ed. was published in 2011. He has published chapters on aquatic therapy in most of the leading textbooks in rehabilitation, authored aquatic research articles in numerous journals and lectured nationally and internationally in the area of aquatics. In 1999, the Aquatic Therapy and Rehabilitation Institute named Dr. Becker as Aquatic Professional of the Year. He was the recipient of the John K. Williams Award from the International Swimming Hall of Fame in May 2011 for his work in adapted aquatics. He is the recipient of major aquatic research grants from the National Swimming Pool Foundation, and is currently Director of Health Benefit Research for that foundation.



Daisuke Sato

Niigata University of Health and Welfare, Institute for Human movement and Medical Sciences, Japan

Daisuke Sato has always been involved in the study of human movement in water initially concentrating on elderly populations under the leadership of Prof Nomura. He also examined muscle activity during deep water running together with colleagues. More recently he has concentrated on the neurophysiology of immersion: Does water immersion affect the central nerve system in humans? This work certainly has applications to therapy in water as well as motor control in swimmers in general.



Maria Fragala-Pinkham

Franciscan Hospital for Children, Boston, USA

Maria Fragala-Pinkham PT, DPT, MS, is a physical therapist and clinical researcher at Franciscan Hospital for Children in Boston. She has worked in a variety of settings including early intervention, schools, home care and outpatient clinics. Renowned for her clinical and teaching excellence, Maria conducts workshops throughout the United States. She has developed community-based adapted sports and fitness programs for children including an adapted ice skating program and an aquatic exercise and swimming program. She is one of the authors of the recently revised Pediatric Evaluation of Disability Inventory – Computer Adaptive Test which measures functional abilities in youth with disabilities. She has published articles on the topics of pediatric outcome measures, aquatic physical therapy intervention, and effectiveness of therapeutic interventions and fitness for children with disabilities.



Paula Richley Geigle

University of Maryland, Baltimore, USA

Paula's practice experience includes lifespan treatment, physical therapy education, and clinical research. Her professional preparation includes: BS from Penn State, physical therapy training from Hahnemann Medical School, MS and PhD from University of Delaware, and postdoctoral training in clinical biostatistics/epidemiology at The University of Pennsylvania. Aquatic Physical Therapy Section roles (American Physical Therapy Association) included: president, secretary, bylaws chair, first recipient of the Section's Swim Ex Clinical Research Grant for her study: Aquatic Exercise in Breast Cancer Related Lymphedema Management; and currently co-PI on a 1.4 million dollar, Department of Defense award investigating Aquatic and Lokomat exercise outcomes for individuals with spinal cord injury. In addition to peer reviewed articles, Dr. Geigle co-authored the text book Aquatic Exercise: Rehabilitation and Training.



Romain Forestier

Centre de recherche rhumatologique et thermal d'Aix-Les-Bains, France

Romain Forestier is Rheumatologist. He has been Président of the Centre de recherche rhumatologique et thermal d'Aix-Les-Bains, France since 1998, Vice-Président of The French Society of Medical Hydrology since 2011 (président from 2009 to 2011) and a Member of administration council of the syndicate of rheumatologists. He is a Member de la Société Française de Rhumatologie (SFR) and of the foot an ankle surgery association. He is on the editorial committee of Presse thermale et climatique. He has helped developed guidelines for physiotherapy treatment of low back pain, Non-drug treatments for rheumatoid arthritis and Diagnosis and treatment of ankylose spondylitis. He teaches in the degree program for medical hydrology in Grenoble and in the sports science and nursing programs in Chambéry. He has published more than 20 articles on Spa therapy, Crenobalneotherapy and Rheumatism

Podium Programme

Wednesday 15 April, 2015

When	What
11:00 – 14:15	Registration (poster placement)
14:15 – 14:45	Opening Ceremony
14:45 – 15:30	KEY NOTE - Paula Geigle : <i>University Maryland</i> Aquatic Therapy (AT) and Robotic Assisted Body Weight Supported Treadmill Training (RABWSTT) for Individuals with Chronic Motor Incomplete Spinal Cord Injury (CMISCI)
15:30 – 16:00	Coffee Break
16:00 – 16:15	PS 01 – Antonio Cuesta-Vargas - <i>Universidad de Malaga</i> Effect of an 8-week of swim with snorkel within a multimodal physiotherapy program in patients with chronic non-specific neck pain.
16:15 – 16:30	PS 02 – Ilaria Zivi - <i>Ospedale Moriggia-Pelascini</i> Aquatic physiotherapy in peripheral neuropathies: a standardized rehabilitative protocol
16:30 – 16:45	PS 03 – Rosane Barroso Caetano - <i>Universit Federal of Sao Paulo</i> Response to effort during walking on soil and immersion in people with Duchenne muscular dystrophy – case series
16:45 – 17:00	PS 04 - Prashanth Chettiar Gopal – <i>SDM college of Physiotherapy</i> Aquatic Therapy in India – An insight to understand obstacles and strategies for awareness
17:00 – 17:45	Poster session 1
17:45 – 18:15	Workshop: Systematic Reviewing (D. Daly & B. Waller)
18:15 – 19:30	Free Time
19:30 – 21:00	Welcome reception at City Hall of Leuven

Thursday 16 April, 2015

When	What
09:00 – 09:45	KEY NOTE – Bruce Becker, <i>Washington State University</i> Immersion and Aquatic Activity: Implications for Brain Function
09:45 – 10:00	PS 05 – Adriano Coladonato – <i>Università di Roma</i> Evidence based aquatic therapy vs. clinical practice: a systematic review and a survey among Italian aquatic therapists
10:00 – 10:15	PS 06 – Magdy Abouzeid – <i>Alexandria University</i> Cardiopulmonary Responses to Swim Training in Wheelchair Swimmers (Paraplegic VS. Amputee)
10:15 – 10:45	Coffee Break
10:45 – 11:00	PS 07 – Paula Geigle – <i>University of Maryland</i> Abdominal Adiposity, Insulin Resistance, and Prescribed Aquatic Exercise for Two People with Chronic Motor Incomplete Spinal Cord Injury (CMISCI): A Case Report

11:00 – 11:15	PS 08 – Anna Ogonowska-Slodownik – <i>AWF Warsaw</i> The effect of aquatic versus land exercise on physical function in older people: a systematic review with meta-analysis
11:30 – 11:45	PS 09 – Ayse Nur Tunali - <i>Üsküdar University</i> Comparison of the effects of land-based and water-based exercises on functional capacity and quality of life in geriatric age group
11:45 – 12:00	PS 10 – César Sá - <i>Universidade Lusófona</i> Results of an aquatic exercise program on balance, risk of falls, fear of falling and quality of life in older adults, during 12 weeks
12:00 – 13:00	Lunch
13:00 – 13:45	KEY NOTE – Maria Fragala: <i>Franciscan Hospital for Children, Boston</i> , Aquatic exercise for promoting physical activity and fitness in children with disabilities
13:45 – 14:00	PS 11 – Hagit Friedman - <i>University of Haifa</i> Significance of infant aquatics unique approach for neural development of premature infants
14:00 – 14:15	PS 12 – Jan Nevrkla - <i>Kontakt BB</i> Swimming academy beyond borders aqua(e)motion therapy
14:15 – 14:30	PS 13 – Ruthy Tirosh - <i>Alyn Hospital</i> Setting goals is the goal
14:30 – 14:45	PS 14 – Foteini Pagou - <i>Metropolitan College Thessaloniki, Greece</i> The factors and the benefits of an efficient inclusive swim program for the children with and without intellectual disabilities: a qualitative research in Greece
14:30 – 14:45	PS 15 – Patty Van 't Hooft – <i>Windesheim University of applied science</i> The effect of the picto method in the swimming classes of children with autism spectrum disorder
14:45 – 15:30	Coffee break and poster session 2
15:30 – 16:15	KEY NOTE – Asa Cider: <i>Sahlgrenska University Hospital, Gothenburg</i> Cardiology and Water Training
16:15 – 16:30	PS 16 – Judith Schultheisz - <i>Gezenguz Foundation</i> Neuro-Hydrotherapy in Early Childhood Intervention
16:30 – 16:45	PS 17 – Sara Stickl - <i>Gezenguz Foundation</i> The effectiveness of an intensive halliwick therapy in children with damaged central nervous system
16:45 – 17:00	PS 18 – Ana Querido – <i>Faculty of Sport, University of Porto</i> The added value of water for swimmers with down syndrome
17:00 – 17:15	PS 19 – Amruta Paranjape - <i>NeuroGen Brain and Spine Institute</i> Awareness of aquatic therapy in Indian physiotherapists and physiotherapy students
17:15 – 17:30	Free time
17:30 – 18:00	- Pool demo (J.V. de Rakt, see abstract POST17)
18:00 – 18:30	- Pool demo (Jan Nevrkla – Swimmers with high impairment, see abstract PS12)
18:30 – 19:30	Workshop EMG: Jonas Martens & Ingi Þór Einarsson

Friday 17 April, 2015

When	What
09:00 – 09:45	KEY NOTE – Roman Forestier: <i>Centre de recherche rhumatologique et thermal d’Aix-Les-Bains</i> , Therapeutic aquatic exercises, immersion and balneotherapy in rheumatologic disorders
09:45 – 10:00	PS 20 – Carla Morer - <i>Universty Complutense of Madrid</i> Stroke treatment in health resorts
10:00 – 10:15	PS 21 – Gulbin Ergin - <i>Dokuz Eylul University</i> The effects of aqua-lympathic therapy on lymphedema severity, social appearance and functional capacity lower extremity lymphedema patients – pilot study
10:15 – 10:45	Coffee Break
10:45 – 11:00	PS 22 – Osnat Fliess Douer – <i>Zinman College for Physical Education and Sport Sciences at the Wingate Institute</i> An innovative model of group therapy for bereaved families through combined Jahara and psychotherapy treatments
11:00 – 11:15	PS 23 – Fabio Jakaitis – <i>Albert Einstein Hospital</i> Analysis of the effects of sensorimotor aquatic therapy on patients with high complexity
11:15 – 11:30	PS 24 – Kotzamanidou C. Marianna - <i>Metropolitan College Thessaloniki</i> Gait and balance parameters improvements in adolescents with developmental disorders after an 8- week aquatic therapy program
11:30 – 11:45	PS 25 - Helena Murta – <i>Universidade Lusófona de Humanidades e Tecnologias</i> Analysis of the motivation for hydrotherapy in users with chronic pain
11:45 – 12:00	PS 26 – Stefanie Rewald – <i>Faculty of Health, Medicine and Life Sciences Maastricht University</i> Aquatic circuit training including aqua cycling in patients with knee osteoarthritis – a feasibility study
12:00 – 13:00	Lunch
13:00 – 13:45	KEY NOTE – Ben Waller – <i>University of Jyvaskyla</i> Exercise in the management of osteoarthritis: the role of aquatic exercise from biochemical changes to arthroplasty and beyond
13:45 – 14:00	PS 27 – Fabio Jakaitis - <i>Albert Einstein Hospital</i> Impact of the aquadynamic method of treatment for patients with painful fibromyalgia
14:00 – 14:15	PS 28 – Claire Davies – <i>University of Auckland</i> How does hydrotherapy affect lower limb muscle activity after a ten week programme?
14:15 – 14:30	PS 29 – Krishna Kishore Garikipati – <i>University of Brighton</i> Relationship between fatigue and health related quality of life in people with Multiple Sclerosis after six sessions of aquatic physiotherapy
14:30 – 14:45	PS 30 – Stelios Psycharakis – <i>The University of Edinburgh</i> The water project: which aquatic exercises work best? Identifying muscle recruitment for exercises used in core strengthening and rehabilitation programmes
14:45 – 15:15	Coffee break

15:15 – 16:00	KEY NOTE – Daisuke Sato: <i>Niigata University of Health and Welfare</i> Water immersion modulates sensory and motor cortical excitability
16:00 – 16:15	PS 31 – Bodo Ungerechts - <i>University Bielefeld</i> Ears drive hands: sonification of liquid effects induced by aquatic space activities contributes to cognitive representation
16:15 – 16:30	PS 32 – Francesco Gotti - <i>Moriggia-Pelascini Hospital</i> Efficacy of hydrotherapy on Parkinson's disease: a randomized study with 6-months follow-up
16:30 – 16:45	PS 33 – Ilker Yilmaz – <i>Anadolu University</i> Early Aquatic Intervention for Children with Autism Spectrum Disorders
16:45 – 17:00	PS 34 – Baris Gürpınar - <i>Dokuz Eylül University</i> Identifying the Perceived Barriers and Motivators of Aqua Therapy Applications in Turkey
17:00 – 18:30	Free time
18:30 – 22u30	Closing dinner at Faculty Club

Saturday 18 April, 2015

EWAC Medical, a world leader in production of aquatic therapy facilities and equipment is a major sponsor of Aqua-Leuven2015. EWAC actively endorses the advancement and sharing of knowledge in the area of aquatic therapy.

To this goal on Saturday April 18th the final day of Aqua-Leuven, a workshop will be organized for all participants presenting the latest EWAC equipment. Experts will introduce and demonstrate the potential of the Underwater treadmill, the Obstacle course and the Aquabike. Participants will not only see the equipment but be able to experience it themselves in the pool. We think you will find this is a more than fitting ending to your days in Leuven.

When	What
09:00 – 09:15	Introduction : Eric Legdeur, CEO EWAC Medical
09:15 – 10:00	Background presentations : Ben Waller - University of Jyväskylä, Finland : High intensity interval training on an underwater treadmill and bike Urs Gamper - Rehabilitation Centre, Valens, Switzerland : Underwater treadmill and gait variability in patients with hemiplegia Johan Lambeck – KU Leuven, Belgium : Training static and dynamic stability using underwater obstacles
10:00 – 10:20	Transfer to the pool
10:20 – 11:10	Pool demonstration by experts
11:10 – 12:00	Participants can experience equipment (take swimming gear!)
12:20 – 13:20	Lunch

Poster program

Schedule for dedicated poster presentations (3 minutes per poster):

- Wednesday 15/04 – 5:00 PM to 5:45 PM : presentation of all **EVEN POSTER NUMBERS**

- Thursday 16/04 – 2:45 PM to 3:30 PM : presentation of all **UNEVEN POSTER NUMBERS**

POST01

AQUATIC EXERCISES FOR INDIVIDUALS WITH CEREBRAL PALSY

Yanardag, M and Yilmaz, I

Anadolu University, Eskisehir, Turkey

POST02

EFFECTS OF WATER EXERCISE ON AEROBIC AND FUNCTION ABILITIES AT CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

Aleksandrović, M.¹, Cirovic, V¹, Jorgić, B.¹, Zrnzevic, J.¹, Arslan, D.², Ozsari, M.²

¹Faculty of Sport, Nis, Serbia

²National Sports Academy, Nis, Bulgaria

POST 03

IMPROVEMENT OF GROSS MOTOR FUNCTION AND SWIMMING SKILLS BY USING AQUATIC EXERCISE IN CHILDREN WITH CEREBRAL PALSY

Jorgić, B.¹, Aleksandrović, M¹., Ozsari, M²., Arslan, D².

¹Faculty of Sport and Physical Education, University of Niš, Serbia

² National Sports Academy, University of Sofia, Bulgaria

POST04

BIOMECHANICS PRE- AND POST- HYDROTHERAPY TREATMENT OF ADULTS WITH CEREBRAL PALSY

Davies, C, Branch, J, Zhang, Y

University of Auckland, Auckland, New Zealand

POST05

THE EFFECTIVENESS OF AQUATHERAPY IN THE TREATMENT OF CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

Palmieri, M.S Bortone, A, Curzi, M

Institute Santo Stefano, Potenza Picena (MC), Italy

POST06

COMPARISON OF PASSIVE RANGE OF MOTION OF THE UPPER AND LOWER EXTREMITIES AFTER A SESSION OF CLASSICAL HYDROTHERAPY VS. HALLIWIC IN CHILDREN WITH CEREBRAL PALSY: RANDOMIZED CLINICAL TRIAL

Meyer, E.¹ VanHeuverzwijn, A,² Remacle, M,² Lambeck, J³

¹ISEK/FSM-ULB, ²FSM-ULB, ³K.U.Leuven

POST07

THE BENEFITS OF AQUATIC THERAPY IN A CASE OF DUPLICATION OF CHROMOSOME 17p13.3

Martínez, B¹, Gueita, J², Rosell, J³, Ruiz, M¹

¹Fisih₂₀, Palma de Mallorca, Spain

²Department of Physical Therapy. Universidad Rey Juan Carlos, Madrid, Spain

³Genetics Service. Hospital Universitario Son Espases., Palma de Mallorca, Spain

POST08

TRANSLATION AND CROSS-CULTURAL ADAPTATION OF S.W.I.M. SCALE.

Ribeiro de Lima, A.A¹, Caromano, F.A¹, Favero, F.M², Voos, M¹, Caetano, R.B²

¹São Paulo University, São Paulo, Brazil

²Federal University of São Paulo, São Paulo, Brazil

POST09

INFLUENCE OF COLD OR WARM WATER IMMERSION ON MUSCULAR DISPLACEMENT AND MUSCLE CONTRACTION TIME

Mur, E

UVIC - UCC, Barcelona, Spain

POST10

AQUATIC THERAPY IN THE TREATMENT OF PEOPLE WITH SEVERE MENTAL ILLNESS

Bouzas, M.S¹and Faílde, R.M²

¹Hospital Universitario Son Espases, A Coruña, Spain

²Universidad de A Coruña, A Coruña, Spain

POST11

HYDROTHERAPY AS AN ADJUNCT TO PHYSIOTHERAPY MANAGEMENT IN AN INFANT WITH OBSTETRIC BRACHIAL PLEXUS PALSY: A CASE REPORT

Skoutelis, V, Iatrou, D

E.N.A.Private Rehabilitation Centre for Children with Developmental Disabilities, Chalandri-Athens, Greece

POST12

INFANT AQUATICS UNIQUE APPROACH FOR YOUNG INFANTS BORN PREMATURE

Friedman, H¹, Barmatz, C², Lazitz-Dor, A², Naum, L², Casher, H³, Bar-Yosef, O⁴

¹University of Haifa, Zichron-Yaakov, Israel

²Hydrotherapy, Sheba Medical Center, Ramat-Gan, Israel

³Neonatology Department Sheba Medical Center, Ramat-Gan, Israel

⁴Pediatric Neurology Institute, Safra Children's Hospital, Sheba Medical Center, Ramat-Gan, Israel

POST13

EFFECTIVENESS OF AQUATIC PHYSICAL THERAPY MECHANICAL BACK PAIN - HIAE PROTOCOL

Jakaitis, F, Alves, T. L, Balieiro de Freitas, G, Gusman, S, Seccacci, M.L, Leite, J, Borin, P.L.H
Albert Einstein Hospital, São Paulo, Brazil

POST14

THE EFFECTS OF COMBINED SPA -EXERCISE THERAPY ON BALANCE AND PERIPHERAL MUSCLE STRENGTH RELATED SYMPTOMS IN PATIENTS WITH SPONDYLOARTHROPATHY

Gürpınar, B¹, Burcu Aplak Arın², Nursen İlçin¹

¹Dokuz Eylül University, Izmir, Turkey

²Balçova Thermal Treatment Centre, İzmir, Türkiye

POST15

EFFICACY OF AQUA CYCLING ON PAIN AND PHYSICAL FUNCTIONING IN PATIENTS WITH KNEE OSTEOARTHRITIS - A STUDY PROTOCOL

Rewald, S¹, Mesters, I², Emans, P³, Lenssen, T⁴ and Bie, R²

¹Faculty of Health, Medicine and Life Sciences, Maastricht, Netherlands

²Research School Caphri, Maastricht, Nederland

³Maastricht University Medical Centre, Department of Orthopaedic Surgery, Maastricht, Nederland

⁴Maastricht University Medical Centre, Department of Physiotherapy, Maastricht, Nederland

POST16

ADVANTAGES OF THERAPEUTIC BATH IN SULPHUROUS WATER OF POSTTRAUMATIC PATIENTS IN SPA RESORT PUCIOASA-ROMANIA

Nica, S.A, Meiu, L.S, Moise, M., Mitoiu, B

National Institute of Rehabilitation/University of Medicine Carol Davila, Bucharest, Romania

POST17

BALANCE TRAINING AND ASSESSMENT IN AQUATIC PHYSICAL THERAPY – WORKSHOP

Rakt, J.V. de

Nursing Home Waelwick, Wijchen, Netherlands

POST18

EFFECTS OF AN AQUATIC THERAPY PROGRAM IN BALANCE, AND RISK OF FALLS, IN OLDER ADULTS: A SYSTEMATIC REVIEW

Sá, C and Palmeira, A

Universidade Lusófona, Lisbon, Portugal

POST19

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Key notes

EXERCISE IN THE MANAGEMENT OF OSTEOARTHRITIS: THE ROLE OF AQUATIC EXERCISE FROM BIOCHEMICAL CHANGES TO ARTHROPLASTY AND BEYOND

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Osteoarthritis (OA) is the most common form of arthritis and places a huge burden on health care services. Early OA is characterized by changes to the biochemical and physical structure of the articular cartilage resulting in a decreased ability to withstand mechanical loading leading to a gradual loss of cartilage resulting pain as a result of inflammatory processes. This causes a negative cycle of decreased functional capacity, reduced physical activity and increased pain. There is currently no known cure for OA and management focuses on non-pharmacological (eg, exercise, education), pharmacological, and treatments. In recent years there has been a shift to investigating modalities that prevent the progression of early stage osteoarthritis and this has led to both innovative treatment and non-invasive assessment techniques (e.g. quantitative MRI). Exercise in the form of land-based strengthening, aerobic conditioning, therapeutic aquatic exercise and weight loss are considered the most central elements in the current non-pharmacological recommendations in the management and prevention of OA. The aquatic environment has long been used in the management of symptoms associated with osteoarthritis, however current evidence suggests that therapeutic aquatic exercises are only as equally effective as, but not superior to, land based exercises in the management of symptoms associated with osteoarthritis. Further, our recent systematic review aquatic exercise was found to be superior to no intervention in self-reported outcomes e.g. pain, stiffness and self-assessed functioning but had no significant effect on physical performance measures (e.g. strength, functioning). Moreover, aquatic exercise has often been championed for this population because impact training has long been thought to have a negative effect on this patient group. In contrast, our research has suggested that osteogenic type exercises (exercise with impact) are an appropriate, non-harmful and an essential training modality for this population, at least during the early phase of the disease. Therefore, this raises the question about the precise role of aquatic exercise in the management and prevention of OA. This presentation will describe the latest scientific evidence investigating the effects of exercise for people with OA with a focus on aquatic exercise and its application in the clinical setting. The latest data will presented for the effects of aquatic exercise at different stages of the disease progression early OA to surgery as well as the post-operative management.

IMMERSION AND AQUATIC ACTIVITY: IMPLICATIONS FOR BRAIN FUNCTION

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The calming influence of aquatic immersion has been recognized for as long as human history has been recorded. Recent scientific research has begun to unravel the powerful physiologic reasons for these effects. Even more importantly, the physiology of immersion creates an increase in brain blood flow, with consequent residual effects on maintaining arterial compliance, reducing arterial stiffness and the age-related processes that diminish neuronal oxygen availability. The combination of these effects may be why immersion has also been clinically found to improve cognitive functioning in traumatic brain injury, and Alzheimer's dementia. This lecture will discuss the recent research leading to these hypotheses, and next steps in further elucidating the benefits of aquatic immersion on cerebral function.

Aquatic exercise in patients with cardiac disease

Exercise is the cornerstone of cardiac rehabilitation since it reduces mortality in patients with ischemic heart disease by 26 % and in patients with chronic heart failure by 12 % compared to patients that do not take part of exercise based cardiac rehabilitation. Further exercise improves quality of life and reduces hospital admissions. But, a large amount of patients with cardiac diseases also have other diseases and disabilities, i.e. obesity, orthopedic diseases and diabetes, that hinders exercise on land and therefore aquatic exercise could enhance the possibility to achieve an improved physical fitness for patients with cardiac disease and comorbidities. Aquatic exercise has during the last century not been advocated as an appropriate type of exercise in patients with cardiac disease due to concerns of the increased preload caused by the hydrostatic pressure. However in ancient times water immersion was used as a way to achieve a diuretic effect in patients with heart failure. In our research group we have studied the hemodynamic effect of water immersion in patients with chronic heart failure. In these patients immersion in warm water (33-34° C) increased stroke volume, cardiac output and ejection fraction while peripheral resistance and heart frequency decreased. An improved diastolic function was also a result of water immersion probably induced by the reduced heart frequency. The majority of patients with chronic heart failure improved their cardiac function when immersed in warm water, however one patient did not. This patient suffered from a biventricular reduced ejection fraction and a mitral insufficiency. If this kind of patients should be warned to exercise in water needs further investigation. In a recently published review of aquatic exercise in patients with chronic heart failure found that aquatic exercise did increase physical fitness and quality of life but the effect on hemodynamics of aquatic exercise compared to land exercise needs to further be evaluated. The effect of aquatic exercise in patients with ischemic heart disease is less investigated but also these patients seem to benefit regarding peak oxygen uptake and quality of life from an aquatic exercise program. Earlier there have been concerns in patients with ischemic heart disease regarding an increased onset of arrhythmia and silent angina during aquatic exercise. However, these concerns have been decreased recently by a study that compared aquatic exercise and land exercise in patients with ischemic heart disease and found no difference according arrhythmia and the occurrence of angina.

Aquatic exercise is one type of exercise that can be used in patients with chronic heart failure and ischemic heart failure, especially in those patients that also had comorbidities that hinder exercise on land.

WATER IMMERSION MODULATES SENSORY AND MOTOR CORTICAL EXCITABILITY

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Water immersion (WI) induces various physiological responses depending on somatosensory inputs, such as tactile, pressure, and proprioceptive stimuli. These physiological changes can have therapeutic benefits, and WI has been used in rehabilitation regimens for patients with orthopedic, cardiovascular, and respiratory disorders. WI once a week has been shown to improve the activities of daily living in frail elderly people (Sato et al. 2007). We surmised that somatosensory inputs from WI enhance the cortical processing of sensory and motor information and facilitate rehabilitation. First, we investigated whether whole-body WI changed sensory and motor cortical excitability induced by afferent inputs using functional near-infrared spectroscopy and electroencephalography (Sato et al. 2012a; Sato et al. 2012b). These studies showed that afferent inputs during WI changed the activities in sensory areas, including the primary somatosensory cortex (S1) and the posterior parietal cortex. Second, we examined whether the cortical activity in the somatosensory areas affected motor cortical excitability using transcranial magnetic stimulation and found that WI modulated sensorimotor integration (Sato et al. 2013). However, corticospinal excitability and intracortical circuits were unchanged because the motor-evoked potentials (MEPs) were measured in the hands that were not in the water. According to the results of the effects of cutaneous afferent inputs on excitability in the primary motor cortex (M1), stimulus intensity may be an important parameter in the modulation of corticomotor excitability. For example, electrical stimuli with intensities that are greater than the motor threshold increase the motor excitability of the stimulated muscles by the corticomotor pathways. In contrast, the results are equivocal on the effects of electrical stimuli with intensities that are less than the motor threshold but sufficient to induce sensory perception on the excitability of corticomotor pathways (Chipchase et al. 2011). Moreover, experiments with neurography have shown that proprioceptive input affects the sensorimotor cortex (Heath et al. 1976; Jones and Porter 1980), and muscle vibration that produces Ia afferent activation induces lasting effects on cortical excitability (Rosenkranz et al. 2003; Rosenkranz and Rothwell 2003). Therefore, in our recent study, we examined whole-hand WI and water flow (WF) stimulation using a WF device that was originally used for partial WI studies. Whole-hand WI resulted in stimulation of the hand corticomotor representation to a wide area, and touching water with the whole hand generated afferent input from the cutaneous afferents (Type-II fiber group) that projected to S1 and mainly Brodmann Area 3B. Moreover, we expected that whole-hand WF would elicit a greater cutaneous input than whole-hand WI and that proprioceptive input, induced by skin and muscle movement, would increase M1 excitability. We investigated whether whole-hand WI and WF changed corticospinal excitability and intracortical circuits by measuring MEP recruitment curves and conditioned amplitudes. Whole-hand WI alone did not change the MEP recruitment curves, short-interval cortical inhibition, or intracortical facilitation in both the first dorsal interosseus and abductor digiti minimi muscles. In contrast, whole-hand WI with WF increased MEP recruitment curves and intracortical facilitation and decreased the short-interval cortical inhibition only in the first dorsal interosseus muscle. These results suggest that whole-hand WF modulates corticospinal excitability as well as intracortical inhibitory and excitatory circuits in vibrated muscle. These sequence studies suggest that WI and WF might be used in a neurorehabilitation regimen.

AQUATIC EXERCISE FOR PROMOTING PHYSICAL ACTIVITY AND FITNESS IN CHILDREN WITH DISABILITIES

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Children with disabilities have decreased aerobic capacity, muscle endurance, balance and coordination which limit gross motor skills and ability to participate with peers in community-based activities. Children with disabilities tend to be less physically active than their peers without disabilities. Decreased fitness and physical activity levels can put children at risk for developing secondary health problems. Physical therapy interventions which can increase participation, functional mobility and gross motor skills, and aerobic capacity are important for children with disabilities. Aquatic exercise with task-specific training has gained popularity for children with cerebral palsy and recent evidence although limited is promising. For some children with cerebral palsy, the aquatic environment can be motivating and exercises can be accomplished with less impact or loading on joints. This feature of aquatic exercise may offer an advantage to children with cerebral palsy and other disabilities who have muscle weakness, poor joint alignment and potential for orthopedic problems and joint pain. Buoyancy provides support while viscosity and drag forces of water provide resistance to movement and potential for muscle strengthening. For children with cerebral palsy, classified at Gross Motor Function Classification System Levels IV and V who have limited active movement and mobility on land, the aquatic environment can provide a setting which promotes active movement and opportunity for aerobic exercise. For youth with autism who also may have decreased fitness and physical activity levels, the aquatic setting may provide sensory and postural support making exercising in the water more motivating than exercising on land. For this presentation, evidence on aquatic exercise in children with disabilities (cerebral palsy, autism and attention deficit hyperactivity disorder) will be reviewed. Intervention strategies including aquatic exercises and activities for children with disabilities as well as aerobic exercise dosing and heart rate monitoring will be covered. Aerobic exercise frequency, duration, and intensity for children with disabilities as well as aquatic setting will be discussed. Future aquatic exercise research directions in terms of dosing aquatic exercise to improve health, fitness, physical activity and function in children with disabilities will also be discussed.

AQUATIC THERAPY (AT) AND ROBOTIC ASSISTED BODY WEIGHT SUPPORTED TREADMILL TRAINING (RABWSTT) FOR INDIVIDUALS WITH CHRONIC MOTOR INCOMPLETE SPINAL CORD INJURY (CMISCI)

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Individuals with CMISCI experience lack of endurance and limitations in ambulatory ability. AT is frequently used clinically for functional improvement with limited supporting research. More evidence exists for RABWSTT using Lokomat® to understand the resultant cardiovascular and functional effects. We assessed and compared AT and RABWSTT effects upon cardiovascular fitness and functional ambulation in this population. We conducted a dual center, cross-over trial in CMISCI (Level C2 to T12, AIS C and D) with thirty-seven participants randomized first into either 36 sessions of AT or RABWSTT for 72 total sessions with a prescribed cardiovascular and functional protocol. Baseline, crossover, and endpoint outcome assessments included arm ergometer VO₂ peak, RABWSTT ergometer VO₂ peak (across the RABWSTT component), step activity monitor (SAM), six minute walk test (6MWT), and 10 meter walk test at normal and fast pace. Increased RABWSTT peak VO₂ of 13.88% (p=0.03) occurred with Lokomat training with an additional increase of 5.85% (p=0.022) in arm ergometer peak VO₂ with AT after this initial BWSRSTT. AT increased ambulation speed in the 10 MWT self-selected normal pace by 9.4%, but this value decreased 9.9% after Lokomat training, a 19.3% difference (p=0.046). SAM showed the greatest difference between interventions with a 33.7% greater outcome with AT than RABWSTT (p=0.024). Demonstrated selected improvement occurred in RABWSTT peak VO₂ and AT ambulation speed with response variability in all outcome categories. Subgroup analysis suggested response predictors exist based on distinct categories for each intervention, supporting the need to individualize exercise prescription and dosage.

THERAPEUTIC AQUATIC EXERCISES, IMMERSION AND BALNEOTHERAPY IN RHEUMATOLOGIC DISORDERS

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The presentation will give the results of a narrative review identifying trials evaluating water interventions for rheumatic disorders and summarizing in which fields they are effective. For water exercises, a literature search was conducted across the following electronic databases: PubMed, Medline, Cinahl, Sports Discus, and PEDro. For balneotherapy the search was limited to Medline, the bibliography of the identified articles and personal data. The following selection criteria were used for water exercises, systematic reviews and randomized controlled trials that assessed treatment outcomes for osteoarthritis (OA), low back pain (LBP), neck pain, fibromyalgia, rheumatoid arthritis (RA), ankylosing spondylitis (AS), shoulder pain, joint replacement. Participants of any age trial in English and French language were included. For balneotherapy randomized trials and quasi randomized trials were selected for the same disorders. For water exercise, methodological analysis used the conclusions of the systematic review and Delphi/Pedro score for the recent trials. For balneotherapy methodological analysis used the Delphi/CLEAR assessment for internal validity and a personal list for external validity and statistical validity. Water exercises improve patients with LBP (pain, endurance), OA (pain aerobic fitness, function, balance and risk of falling), joint replacement (mobility in early post op, muscle strength in late phase), fibromyalgia (pain, function quality of life), AS (aerobic fitness, respiratory function and chest wall expansion) and RA (function, aerobic fitness). Balneotherapy improves patients with LBP (pain function, quality of life, drug intake), OA (pain function, opinion of patient, opinion of practitioner), fibromyalgia (pain, function opinion of patient, opinion of practitioner, tender point count, fatigue), shoulder pain (pain), AS (pain, function, cost effectiveness) and RA (quality of life). The level of evidence is higher for a combination of mineral water, hydrotherapy technique and water exercises. Combining water exercises and modern rehabilitation techniques with traditional balneotherapy may improve the efficacy of this treatment. Water exercises improve patients with LBP, OA, joint replacement, fibromyalgia, AS and RA. Balneotherapy improves patients with LBP, OA, fibromyalgia, shoulder pain, AS and RA. Combining water exercises and modern rehabilitation techniques with traditional balneotherapy and hydrotherapy techniques may improve the efficacy of this treatment

Podium presentations

Alphabetical by first author, presenting author is underlined, program number is indicated

PS 06

CARDIOPULMONARY RESPONSES TO SWIM TRAINING IN WHEELCHAIR SWIMMERS (PARAPLEGIC VS. AMPUTEE).

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INTRODUCTION: Athletes with special needs represent a growing population of sports participants. Currently, interest in the physical capacity of persons with functional impairment of the lower part of the body and the legs has been increasing. Subjects with paraplegia and amputation don't use their legs in their daily lives which make affect respiratory function and other internal organ of body. According to the law of use 'what you don't use you lose'. So, not using their legs is considered to be amongst factors that may affect the respiratory function. There is limited research examined the differences between paraplegia and amputee swimmers on respiratory function. The aim of these study is determined and compared Cardiopulmonary responses following long-term swim training (LTST), 24 weeks, 6 times per week, 120 min per unit in male wheelchair swimmers (amputee vs. paraplegic).

METHODS: To study these effects, seven swimmers with below-knee amputation (group A) aged (18.3 ± 0.88 yr), Ht (168.1 ± 1.67 cm) Wt (68.2 ± 3.7 kg) were Compared with seven swimmers with paraplegia (group P) aged (18.6 ± 0.92 yr), Ht (167 ± 2.16 cm), Wt (68 ± 4.58 kg). All subjects group under went anthropometric and lung function using spirometric test pre and post swim training (24 weeks). Subjects were matched for age, weight, lung function test.

RESULTS: All data analyses were performed using SPSS; means \pm S.D, t test estimated differences between the tow groups and % improvement were calculated. There were significant differences for cardiopulmonary parameters after training for both groups. The significant observation in this study indicates that swimmers with below-knee amputation showed a greater improvent in pulmonary function than swimmers with paraplegia.. Group (A) increased (VC.L) by 35.9% vs. group (P) 25.4%, FVC.L increased by group (A) 36.5% vs. group (P) 22.7% FEV1. L increased 37.3% by group (A) vs. 25% group (P). IRV, ERV, IC, TLC, PEF increased by group (A): 23.7%, 12.3%, 16.2% 5.04%, 48.84 respectively vs. group (P) 10.5%, 2.9%, 3.5%, 2.7%, 31.3% respectively. VE.1 and respiratory rate decreased by group (A) 9.98%, 18.7% vs. group (P) 7.6%, 13.4%.

DISCUSSION: The significant observationin this study indicated that below-knee amputated swimmers showed a greater improvment in cardiopulmonary responses than paraplegic swimmers.

CONCLUSION: Swimming training is an effective and suitable sport to enhance physical performance and to induce positive respiratory function adaptation for wheelchair swimmers. The active lower limb muscles in those with amputation increase the ability of the musculoskeletal pump in the legs to be activated and also contribute to venous pooling.

PS 05

EVIDENCE BASED AQUATIC THERAPY VS CLINICAL PRACTICE: A SYSTEMATIC REVIEW AND A SURVEY AMONG ITALIAN AQUATIC THERAPISTS

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INTRODUCTION: Aquatic therapy is a method that encompasses a wide range of rehabilitation practices, and its effectiveness in a variety of pathologies has been demonstrated. The aim of the study is to research the areas of rehabilitation in which aquatic therapy is most commonly used, and to evaluate whether a discrepancy can be found between scientific evidence and clinical practice.

METHODS: A review of the existing literature was carried out, in order to summarize the state of the art in scientific research on aquatic therapy. The PubMed and Pedro databases have been consulted, cross-referencing the MESH terms hydrotherapy, aquatic therapy, aquatic exercise and rehabilitation; systematic reviews (SR) and randomized controlled trials (RCT) have been considered, to analyze the effectiveness of aquatic therapy in the different areas of rehabilitation. Based on the results of this review a questionnaire was prepared, with the goal of surveying the applications of aquatic therapy in clinical practice. The questionnaire was created using the 'Google forms' platform, then it was submitted with a cover letter to members affiliated over the last 6 years to ANIK (Italian national association of aquatic therapists, which is committed to spreading aquatic rehabilitation through activities of research, training, and professional practice).

RESULTS: The initial research led to 1131 studies of potential relevance; all abstracts were scrutinized and 388 studies that fulfilled the inclusion criteria were selected (345 RCTs and 43 SR). The studies were divided according to the pathology considered and to their macro-area of belonging - 37 and 9 respectively. The most studied macro-area for aquatic therapy was orthopedic rehabilitation with 103 RCT (30% of all RCT) and 24 SR (55%); the pathologies on which most publications can be found are arthritis (12% RCT and 9% SR), low back pain (10% RCT and 5% SR) and fibromyalgia (9% RCT and 9% SR). The categories that presented a number of RCT higher than 5, or at least one SR, were introduced as possible answers in the following survey. The questionnaire was sent to 484 email addresses; 124 answers were received, with a response rate of 25%. The rehabilitation macro-area in which aquatic therapy takes place most frequently is orthopedic rehabilitation (58%); the most frequently treated pathologies were hip and knee arthroplasty (55%), low back pain (50%), lower limb ligament injuries (36%); finally, 69% of the interviewees work in the private sector.

CONCLUSION: The concordance between scientific research and clinical practice is strong for the macro-area of rehabilitation in which aquatic therapy is applied, however the concordance is weaker for the investigated pathologies; limited evidence is available for some conditions that are frequently treated with aquatic therapy, therefore, further well conducted studies are encouraged on these topics.

PS 01

EFFECT OF AN 8-WEEK OF SWIM WITH SNORKEL WITHIN A MULTIMODAL PHYSIOTHERAPY PROGRAM IN PATIENTS WITH CHRONIC NON-SPECIFIC NECK PAIN.

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INTRODUCTION: The aim of this study was to analyse the effect of an 8-week multimodal physiotherapy programme (MPP), integrating physical land-based therapeutic exercise (TE), adapted swimming with snorkel and health education, as a treatment for patients with chronic non-specific neck pain (CNSNP), on disability, general health/mental states and quality of life.

METHODS: 175 CNSNP patients from a community-based centre were recruited to participate in this prospective study. Intervention: 60-minute session (30 minutes of land-based exercise dedicated to improving mobility, motor control, resistance and strengthening of the neck muscles, and 30 minutes of adapted swimming with aerobic exercise keeping a neutral neck position using a snorkel). Health education was provided using a decalogue on CNSNP and constant repetition of brief advice by the physiotherapist during the supervision of the exercises in each session. Study outcomes: primary: disability (Neck Disability Index); secondary: physical and mental health states and quality of life of patients (SF-12 and EuroQoL-5D respectively). Differences between baseline data and that at the 8-week follow-up were calculated for all outcome variables.

RESULTS: disability showed a significant improvement of 24.6% from a mean (SD) of 28.2 (13.08) at baseline to 16.88 (11.62) at the end of the 8-week intervention. All secondary outcome variables were observed to show significant, clinically relevant improvements with increase ranges between 13.0% and 16.3% from a mean of 0.70 (0.2) at baseline to 0.83 (0.2), for EuroQoL-5D, and from a mean of 40.6 (12.7) at baseline to 56.9 (9.5), for mental health state, at the end of the 8-week intervention.

CONCLUSION: After 8 weeks of a MPP that integrated land-based physical TE, health education and adapted swimming, clinically relevant improvements in disability, physical and mental health states and quality of life were observed in patients with CNSNP. The clinical efficacy requires verification using a randomised controlled study design.

ClinicalTrials.gov Identifier: NCT02046876

PS 28

HOW DOES HYDROTHERAPY AFFECT LOWER LIMB MUSCLE ACTIVITY AFTER A TEN WEEK PROGRAMME?

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INTRODUCTION: Hereditary spastic paraparesis (HSP) is a group of neurological disorders characterised by slowly progressive increasing muscle tone, predominantly in the lower limbs, with relatively preserved power. This leads to difficulties in motor control and walking. The purpose of this study was to evaluate the surface EMG activity and timing relative to biomechanics to determine whether hydrotherapy was successful in modulating the EMG signal during locomotor function in individuals with late onset HSP.

METHODS: This was a prospective study in which eight individuals with HSP underwent a hydrotherapy programme. Surface EMG (sEMG) signals of the biceps femoris (BF), the rectus femoris (RF), the tibialis anterior (TA), and the gastrocnemius (G) of both legs were obtained prior to and after the programme. Biomechanics data was also collected [1]. A 10-week hydrotherapy programme consisted of two sessions per week each of 45 minutes. In a session, participants would perform several lengths of walking forward, backward and sideways. This was followed by strengthening exercises of the lower limbs using the water for resistance. Swimming activities were also added to the programme if the participant was able to swim independently or with pool noodles for support.

RESULTS: Pre-hydrotherapy, the timing of the RF on heelstrike was normal in 12 (of 16) limbs, and during push-off, ten had normal timing. After therapy, no significant changes were observed. However, the BF activation was later and longer than typical in both stance and swing. At the ankle complex, pre-hydrotherapy fourteen limbs displayed typical timing of the TA on initial contact, but was late to activate during push-off. Post-therapy there appeared to be slightly earlier activation of the TA upon push-off, but poorer recruitment on initial contact. The G was active at initial contact for two participants during pre-therapy testing, but post therapy, active for four.

DISCUSSION: Biomechanics showed evidence of increased extensor moment at the hip post-therapy indicating increase in use of extensor muscles. The sEMG data has shown that both pre- and post- therapy the activation of the BF was longer throughout stance. Additionally, increased internal rotation at the hip was observed on initial contact with limited flexion at the knee. This is consistent with the later activation of RF which acts to externally rotate the hip and flex the knee. At the ankle, activation of the TA resulted in the lack of flexion observed during both swing and stance. G activation on initial contact resulted in a lack of initial dorsiflexion that would be evident in control participants.

CONCLUSION: Surface EMG can be used to enable the researcher to better understand the biomechanics of motion. In this case, the differences in muscle recruitment were used to explain the increased internal rotation of the hip after therapy as well as the decrease in flexion at the knee and ankle.

PS 21

THE EFFECTS OF AQUA-LYMPATHIC THERAPY ON LYMPHEDEMA SEVERITY, SOCIAL APPEARANCE AND FUNCTIONAL CAPACITY LOWER EXTREMITY LYMPHEDEMA PATIENTS - PILOT STUDY

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INTRODUCTION: The conventional treatment for lymphedema is Complex Decongestive Physiotherapy (CDP). CDP has good outcomes during the intensive phase of lymphedema, but it is often difficult to preserve these results through the maintenance phase. The purpose of this study is to present Aqua-Lymphatic Therapy (ALT) method that shows how lower extremity lymphedema patients can take control of their lymphedema in a group setting.

METHODS: Design of the study was single-blind randomized clinical trial. The setting was in a hydrotherapy pool, 1.4 m depth, and a temperature of 31-33,5°C. Twenty patients with unilateral lower extremity lymphedema participated to the study; 18 (90%) female and 2 (10%) male. The intervention group joined two group sessions of ALT in a week for 6 weeks in addition to the self-management therapy directed by a physiotherapist. Foot volume was assessed by a water displacement device, limb volume by circumference measurement from lateral malleolus to 60cm proximal at every 5 cm, social appearance by social appearance anxiety scale (SAAS) and functional capacity by 6 minute walk test. Patients were assessed before and after treatment by the same physiotherapist.

RESULTS: The mean age of the patients was 46,30±13,28 years. There was no episode of leg infection or aggravation in limb volume during the study period. ALT had a positive, statistically and clinically significant effect on limb volume ($p < 0,05$, $p \leq 0,001$) (Shown in Table). Social appearance and functional capacity were also significantly improved in patients ($p < 0,05$, $p < 0,001$) (Shown in Table).

Table. Effects of Aqua-lymphatic Therapy

	Before Aqua-lymphatic Therapy mean ± SD	After Aqua-lymphatic Therapy mean ± SD	P
Circumferences (cm)			
Lateral Malleolus	28,92±3,78	27,97±3,26	,001**
5cm	30,22±9,91	29,55±9,78	,005*
10cm	34,50±12,04	33,95±11,52	,012*
15cm	39,25±11,35	38,10±11,40	,000**
20cm	42,97±10,76	41,97±10,95	,000**
25cm	44,77±10,59	43,72±10,31	,000**
30cm	44,15±10,49	43,20±10,23	,001**
35cm	42,15±9,46	41,42±8,73	,003*
40cm	43,97±7,15	42,77±6,60	,001**
45cm	47,62±8,16	44,42±12,02	,000**
50cm	52,45±8,94	50,80±8,39	,000**
55cm	56,47±9,17	55,25±8,70	,003*
60cm	59,52±9,63	58,65±9,39	,001**
Foot Volume (ml)	1706,25±841,22	1352,75±867,76	,000**
SAAS	41,05±20,89	28,50±14,98	,000**
6min Walk Test (m)	479±57,84	535±61,17	,000**

* $p < 0,05$, ** $p \leq 0,001$

CONCLUSION: ALT was found to be a safe effective method for unilateral lower extremity lymphedema patients during maintenance phase of CDP .

AN INNOVATIVE MODEL OF GROUP THERAPY FOR BEREAVED FAMILIES THROUGH COMBINED JAHARA AND PSYCHOTHERAPY TREATMENTS

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INTRODUCTION: The Jahara® aquatic-therapy has an overall approach aiming to benefit participants on a physical and emotional level. The therapeutics effects of Jahara are: Pain reduction, kinesthetic awareness, increased core muscle strength, improved balance, improved body control, structural expansion, increased flexibility, release of muscle tension and long-lasting feeling of wellbeing. The Jahara treatment for bereaved families focuses on offering a precise support to the skeletal structure and the aching soul. Providing support initiates the trust that allows relaxation to happen. When the body is organized along its axis, relative to the pelvis and back, it can grow. Physical and emotional support allows connection between body and mind, allowing the release of the “systems” that hold the client in suspense, pain and fear. The psychotherapy narrative approach applied in this study aims to assist participants in finding meaning after loss. So far, the Israeli bereaved families were not entitled to receive psychological treatment combined with water therapy. The aim of the intervention was to get the government recognition for such treatments and to promote these treatments funded by government institutions. This pilot study was done in July 2014, at a very stressful period due to a war.

METHODS: A group of 6 participants who had lost their family member (a son, a husband or a brother) in the military or in terror attack met once a week for 3 hours intervention for a period of 5 weeks. On each meeting, each participant received an individual Jahara floating treatment of 30 min. then the entire group joined for a Jahara active-exercise session followed by group psychotherapy session on land. The Jahara treatments were given by 3 advanced Jahara therapists who are also qualified hydrotherapists. The psychotherapy group session was guided by a clinical social worker (PhD), specializes in treating bereaved families. Prior to the intervention, symptoms were collected by the psychotherapist in a narrative method. Among the reported complains were: sleeping problems, physical pain, catastrophic thoughts, mood decline, impatience, difficulty in speaking about the deceased and loneliness. Before and after each session, the participants were asked to report on different aspects regarding their daily routine. The “sharing” was done in a guided way and combined the use of cards, associations, guided imagination and other psychotherapeutic techniques. The Jahara and psychotherapy protocols as well as the participant’s thoughts, feelings and reactions along the intervention were documented.

RESULTS: Following the 5 weeks intervention, improvement was reported in all aspects and in particularly in reduction of pain, increased feeling of control, an ability to talk about the deceased, optimistic thinking and positive future perception.

DISCUSSION: The input of the participants and therapists’ report was handed to the Bereaved Families Division of the Ministry of Defense in Israel. Following the study results, these treatments have been approved and financial support is now offered to bereaved families in the country.

CONCLUSION: A systematic Jahara® program combined with group-therapy work contributes to the reduction of negative symptoms and enhances the well-being of those coping with bereavement.

PS 11

SIGNIFICANCE OF INFANT AQUATICS UNIQUE APPROACH FOR NEURAL DEVELOPMENT OF PREMATURE INFANTS

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INTRODUCTION: Influence of Infant Aquatics on neural development of premature infants is defined through comparing developmental indexes of infants who receive Infant Aquatics with those of infants who do not.

METHODS: 60 premature infants are video recorded in water and on land, to assess their spontaneous random movements. Working technique is a unique model developed by us for young premature infants based on our knowledge in worldwide known hydrotherapy approaches. Training includes passive mobilization, combined rotations and more, while the infant is fully supported by the therapist or parent. Thus, the infant's graceful movements through the water promote a deep state of relaxation with beneficial changes in the autonomic nervous system, decreased heart rate, deeper respiration, and increased peripheral vasodilation. In-water parent participation, contribute to infant-parent bonding and emotional support. Infant neural development is evaluated according to prevalence of complexity, variation, fluency, symmetry, and synchrony.

RESULTS: There has been no report of infant illness associated to training in water. Immediate beneficial results include eliciting of an infant 'quiet alert' state in the water, decreased muscle tone and spasticity, reduction in anxiety and stress levels, improved sleep and feeding, and general comfort due to decreased tension. Infants' reactions during intervention sessions are video recordings. Our results show significant improvement in developmental tracks of infants receiving Infant Aquatics compared to infants who did not. i.e., delta in developmental tracks, between before and after early intervention, is 30%-40% higher when infants receive Infant Aquatics as observed without Infant Aquatics.

DISCUSSION: Mechanism of early intervention will be discussed. Studies proved that early intervention may minimize developmental deficit for infants at risk.

CONCLUSION: We conclude that: (1) Infant Aquatics adjusted for young infants born premature, can be safely applied and regarded as a suitable aquatic rehabilitation approach. (2) Early initiation of Infant Aquatics adjusted for young infants born premature, during pick activity of cortical sub plate, may be beneficial for neural development of preterm infants.

PS 29

RELATIONSHIP BETWEEN FATIGUE AND HEALTH RELATED QUALITY OF LIFE IN PEOPLE WITH MULTIPLE SCLEROSIS AFTER SIX SESSIONS OF AQUATIC PHYSIOTHERAPY

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INTRODUCTION: Fatigue is considered as one of the main problems in people with Multiple Sclerosis (MS). There is some evidence to indicate that increased levels of fatigue can decrease the health related quality of life (HRQOL) in people with MS (Amato et al, 2001). There is evidence to indicate that aquatic physiotherapy is beneficial in improving fatigue and HRQOL in MS (Kargarfard et al, 2011). However no published studies were found to either support or refute the relationship in the effects after a course of aquatic physiotherapy. Therefore the purpose of this study was to look at the relationship between the effects of aquatic physiotherapy on fatigue and HRQOL.

METHODS: Design: Quantitative correlation study design. Prospective single centre study. Participants: Data collected from 103 people with Multiple Sclerosis was included in this study. Intervention: Six sessions of one to one aquatic physiotherapy. Outcome measures: Individual physiotherapy assessments were performed before and after the course of six aquatic physiotherapy sessions. During the assessments, fatigue was measured by using the Modified Fatigue Impact Scale (MFIS) and Health Related Quality of Life was measured by using the Multiple Sclerosis Impact Scale-29 (MSIS-29).

RESULTS: Average age of the participants was 51.8 years (Ranging from 28 to 77 years). There were 22 men and 81 women. Spearman rank-order correlation tests were performed using the Minitab -17 statistical software. Correlation tests performed between the pre MFIS and pre MSIS-29 scores showed a positive correlation ($r_s = 0.610$, P-Value = 0.000). Correlation tests performed between the post MFIS and post MSIS-29 scores showed a positive correlation ($r_s = 0.72$, P-Value = 0.000). The effects of aquatic physiotherapy on the fatigue and health related quality of life scores also showed a positive correlation ($r_s = 0.583$, P-Value = 0.000).

DISCUSSION: The results of this research suggest that there is a relationship between the fatigue and health related quality of life in people with Multiple Sclerosis.

CONCLUSION: The effects gained in the fatigue and health related quality of life after six sessions of aquatic physiotherapy are positively correlated.

PS 07

ABDOMINAL ADIPOSITY, INSULIN RESISTANCE, AND PRESCRIBED AQUATIC EXERCISE FOR TWO PEOPLE WITH CHRONIC MOTOR INCOMPLETE SPINAL CORD INJURY (CMISCI): A CASE REPORT

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INTRODUCTION: To measure abdominal and liver adiposity via Magnetic Imaging Resonance Spectroscopy (MRI/S), glucose, insulin, and Homeostatic Model Assessment-Insulin Resistance (HOMA-IR) before, at crossover, and post two prescriptive exercise interventions for two individuals with chronic motor incomplete spinal cord injury.

METHODS: This pilot project, approved by the University Maryland School of Medicine Human Research Protections Office, spun off from our two-site, Department of Defense funded, randomized clinical trial. A 65 year old female with T1 AIS D paraplegia, 6 years post-injury, BMI (kg/m²) of 23.6, and randomized to robotic intervention first; and a 32 year old male, C7 AIS D tetraplegia, 14 years post injury, BMI (kg/m²) of 23.2, and randomized to aquatic intervention first both engaged in a two-arm, cross-over exercise study, with three months each of aquatic and Lokomat intervention at 65-70% intensity of her heart rate reserve. Outcome measurements included pre, crossover and post results of abdominal, subcutaneous, and liver adiposity via MRI/S (Siemens 3T MRI) with the scanner volume of interest (VOI) the abdominal cavity defined as space corresponds to lumbar spine segments (*L1-L5*); and glucose, insulin and HOMA-IR via standard fasting venipuncture.

RESULTS: Abdominal adiposity reduced for both participants: P18 from 1.8 to 0.9 mm³ and P22 from 1.95 to 0.975 mm³; subcutaneous fat increased for P18 at 2.8 to 3.2 mm³ and reduced slightly for P22 2.75 to 2.6 mm³; liver fat for P18 from 1.5 to 0.48 mm³ and P22 remained 1.1 mm³; glucose P18 decreased from 93 to 75 and P22 88 to 75 mg/dL; insulin also decreased P18 from 6.25 to 5.2 and P22 from 51 to 3.5; and resultant HOMA-IR reduction P18 1.43 to 1.18 and P22 0.99 to 0.7.

DISCUSSION: These 2 cases suggest aerobic exercise may positively alter adiposity, glucose/insulin and HOMA-IR profiles for individuals with chronic motor incomplete spinal cord injury who are not clinically obese or insulin resistant. Investigation if a change in aerobic or functional capacity correlates with these adiposity findings is now underway.

CONCLUSION: These participants with CMISCI while actively exercising at moderate levels significantly decreased abdominal adiposity (based on the standard of 10% reduction positively impacting metabolic risk syndrome). The mechanism for increasing subcutaneous fat is not clearly defined in the available literature. These cases and subsequent research may trigger investigators to more extensively examine the impact moderate exercise exerts upon abdominal adiposity, HOMA-IR, and subcutaneous fat. More importantly is how these variables impact metabolic risk syndrome for individuals with CMISCI.

PS 32

EFFICACY OF HYDROTHERAPY ON PARKINSON'S DISEASE: A RANDOMIZED STUDY WITH 6-MONTHS FOLLOW-UP

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INTRODUCTION: Postural instability (PI) is one of the most disabling problem of patients with Parkinson's disease (PD). PI increases the risk of falls and get worse the quality of life. Hydrotherapy seems to improve balance in PD² but while several studies have examined the effects of land-based³physiotherapy on PI, only few experiences in the past have studied the effects of water-therapy.⁴ Among them, no one had evaluate the efficacy of water on balance in a follow-up period. In this study we have evaluated the efficacy of a water-based treatment versus land-based treatment on balance in PD patients, at the baseline and along a period of 6 months follow-up.

METHODS: The studyb was a randomized observational study. Population was composed by 34 PD patients diagnosed according to the UK Brain Bank criteria in stage 2-3 of Hoehn & Yahr scale. Subjects were randomized in two groups: 17 underwent Multidisciplinary Intensive Rehabilitation Treatment (MIRT)⁵and 17 underwent MIRT associated with a water-therapy treatment (MIRT-WIT). The MIRT-WIT training was 45 minutes, three times perweek for 4 weeks in a warm swimming pool. All sessions started with 10-minute warm-up phase based on walking performance; it was followed by 30-minute second phase, which include specific exercises improving balance. The final 5-minute phase focused on stretching and walking exercises. Patients were evaluated at baseline (T0) at the end of treatment 4 weeks (T1) and at 6 months follow-up (T2). Outcomes were measured using Unified Parkinson's Disease Rating Scale (UPDRS) II, III, Berg Balance Scale (BBS) and Timed Up and Go Test (TUG).

RESULTS: The difference in the two groups (MIRT-WIT versus MIRT) was tested by examining the significance of the time-treatment interaction. Itwas not significant for any of the considered variables, except for BBS ($p=0.0155$). There were no differences in the two groups for UPDRS II, III, and TUG. At the end of the treatment both groups showed a marked reduction in mean values respect to the baseline for UPDRS II-III and TUG ($p<0.0001$). This reduction was completely lost during the follow-up period with a returning of values to the baseline. Otherwise, BBS improvement was maintained over-time in MIRT-WIT group, while returned to the baseline in the MIRT group.

DISCUSSION: This study is the first water-based treatment study with 6-months follow-up demonstrating that the balance improvement remains significant over time. The different physical properties of water can play an important role in improving balance control in patients with PD, permitting balance training in safe conditions. Moreover, execution of exercises in a different gravity environment can lead patients to transform an automatic movement in a voluntary movement improving learning.

CONCLUSION: This study indicates that hydrotherapy may be a possible treatment for balance dysfunction in Parkinsonian patients with a moderate stages of disease.

PS 34

IDENTIFYING THE PERCEIVED BARRIERS AND MOTIVATORS OF AQUA THERAPY APPLICATIONS IN TURKEY

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INTRODUCTION: Aquatic therapy (AT) is a well accepted and widely used method among physiotherapists due to its unique fluid mechanic properties, which provide improved movement capacity and enhanced treatment outcomes. Türkiye is a developing country which has huge potential for aqua therapy and balneology. Yet, exercise in either thermal water or icy water is not a common treatment method, although there has been a growing interest in this topic. The aim of this study is to identify the barriers and motivators of aqua therapy which form this interest and consequently the application of AT.

METHODS: An online questionnaire was prepared, including demographic characteristics, aquatic therapy behaviors and facilities. 11 questions were used to identify barriers and motivations addressed using a 5-point Likert scale with “strongly disagree” and “strongly agree” as anchors. The physiotherapists (PT) were asked “if they use /choose AT” and “If they do not use / choose AT” due to knowledge of PT, perceived risks of AT, personal choice of PT and the patient, and facility issues. The form was sent to mailing groups of Turkish Physical Therapy Association and on three interest groups of physiotherapists on Facebook twice in a fortnight.

RESULTS: The number of responders was 52 (female n=31, 61%; male n=21,39%). Of the responders 62% were female (n=31) and mainly work with neurological (53%, n=27) and orthopaedic (43%, n=22) cases. 43% work in private clinics, 35% work in University Hospitals and 19% in the public sector with number of pools consecutively 3,3 and 4, however only half of these pools were used for AT. 73% (n=37) of the PTs have never used the pool for the last year and the rest use AT regularly (12%, n=6) and seasonally (14%, n=7). According to results lack of facilities (n=37, 73%) and institutional policies (n=24, 47%) were main barriers followed by general health (33%) and hygienic (33%) concerns. The motivators of AT were effective of AT (%80) and improving the quality of care (82%). Although 10% used the pool for treatment purposes, half of the PT's reported that they would personally choose to use AT. On the other hand 45% of the PT did not have any idea if their patients would like to participate in AT (45%) or if AT was financially advantageous (33%).

DISCUSSION: AT has a growing interest in Türkiye and it is important to identify barriers and motivators of AT applications in order to facilitate AT practices. The results show that PTs in Türkiye feel competent and commenced with AT as a treatment option, however access to a treatment pool and institutional policies which mainly run by a physician seem like an obstruction. Furthermore, providing information and practical manuals on hygiene management may improve AT applications.

PS 15

THE EFFECT OF THE PICTO METHOD IN THE SWIMMING CLASSES OF CHILDREN WITH AUTISM SPECTRUM DISORDER

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INTRODUCTION: Children with ASD have deficits in motor coordination skills which can cause limitations in physical activity. A promising intervention is an adjusted aquatic exercise program. To meet the needs of children with ASD a teaching method was developed, the Picto Method (PM) that could be implemented in a swimming program. The PM structures the swimming class by providing pictograms that show children the sequence of the class and the content of the task, avoiding problems of interpretation and distraction that can occur with verbal instructions. The study investigates the effectiveness of the PM, in comparison with verbal instructions on general aquatic skills and on the backstroke specifically. In addition the perceived joy of the children in the control and intervention group was measured.

METHODS: 29 children in the age of 5-12 years, swimming towards certificate A and diagnosed with ASD. The children were randomly assigned to a control (n=12) and intervention group (n=17). The children were measured at T0 and T1 on general aquatic skills using the HAAR and on the quality of the backstroke, using the Backstroke Measurement (BM). During an intervention period of eight swimming lessons, the control group received instruction as usual (IAU), and the intervention group received the instructions using the PM. The perceived joy of the children was measured using the Child Session Rating Scale (CSRS).

RESULTS: The intervention group significantly improved between T0 and T1 on phases 4 and 5 of the HAAR ($p = 0.033$; $p = 0.003$). The control group showed a significant improvement over time on phase 2 ($p = .036$). For the backstroke both control and intervention group significantly improved over time ($p = .013$; $p = .002$). The mean score on the CSRS over all the eight lessons was significantly higher for the intervention group ($p = .016$).

DISCUSSION: Children with ASD benefit both from the PM and the IAU in acquiring the backstroke.

With the PM the children improved more on balance and control and independent movement in water than with verbal instructions. The results on the CSRS showed that the children swimming with the PM had a higher perceived joy.

CONCLUSION: The results of this study taken together indicate that the PM is more effective than IAU; however it is advised to choose a specific method that is in line with the needs of the child.

PS 23

ANALYSIS OF THE EFFECTS OF SENSORIMOTOR AQUATIC THERAPY ON PATIENTS WITH HIGH COMPLEXITY

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INTRODUCTION: In the USA, over one million children suffer from neurological injury, 100,000 and 200,000 among these require hospitalization and remained hospitalized for long periods. In Brazil there are more than 100,000 children in the same situation. The precocious intervention of the aquatic therapy favors a better neurological development, prevention of deformities and improvement of the psychological state of the patient's family members. A previous work, conducted at the same institution with patients in Coma Vigil, demonstrated gain of sensorimotor function in these patients undergoing aquatic therapy, this information underlies this current research that present a protocol for high complexity patients.

METHODS: This is a presentation of a series of patients who underwent a program of aquatic physical therapy during hospitalization. 10 individuals with acute neurological hospital and aged 1-20 years from both sexes were selected.

The Fugl Meyer Scale was used for the assessment. The volunteers underwent daily sessions of aquatic therapy for three months and assessed weekly for clinical comparative analysis.



RESULTS: 9 of 12 subtests showed a high correlation ($IA > 0.75$), in intraevaluation Correlation Coefficient (IA), with a total AI of 90% improvement. Regarding the subscales, there was a variation of 94% improvement in upper limb compared to the lower extremities, which showed 98% in the subgroup of coordination / speed and proprioceptive sensitivity, all proven statistically.

DISCUSSION: Other studies have shown that aquatic therapy improves motor skills like neck control, postural pattern and reduced reflexes of the lower limbs, and this study corroborates this enhancement regarding lower limbs function and posture with this therapy.

In the sensory context, it was observed in the present study, the spatial awareness of lower and upper limbs remained unchanged, confronting the study of Jakaitis and Guazzelli (2005) who found improvement of these aspects on both segments, this may be related to the level of consciousness of the patients who were in a state of Coma Vigil in the previous study, and in this study the patients were in the conscious state.

CONCLUSION: We conclude that high complexity inpatients, have great benefits with the use of aquatic therapy, further studies can be performed to obtain a significant percentage of the population.

PS 27

IMPACT OF THE AQUADINAMIC METHOD OF TREATMENT FOR PATIENTS WITH PAINFUL FIBROMYALGIA

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INTRODUCTION: Fibromyalgia affects about five million Americans and in Brazil it is estimated that 5% of the population have this syndrome. The Aquadinamic is a passive aquatic method that uses meditation and relaxation which provides a quick connection with the vital energy flow, promoting overall relaxation, mobility and activation balance. The Aquadinamic is based on Watsu, Tai Chi and Water Dance methods. This study aims to analyze the applicability of the method in pains and quality of life of fibromyalgia patients.

METHODS: The research was conducted at the Clinical Center Anhanguera with 15 chronic fibromyalgia patients, ages between 30-40 years, from both genders. The research project, as well as the free and informed consent term was submitted to the Ethics Committee on Human Research by Resolution No. 196/96 of the National Health Council. The evaluation consisted of history, physical examination and specific questionnaire. After this, the volunteers underwent 10 Aquadinamic sessions. All subjects were assessed at the 1st and last session. Pain and quality of life were measured by questionnaire on the impact of fibromyalgia (QIF).



RESULTS: The results showed a significant improvement of pain symptoms, represented by 73.33% ($p < 0.05$), and 26.67% showed no changes. Regarding quality of life, there was substantial improvement in 64.00% ($p < 0.05$), with maintenance of 36% of the patients, all tests the Mann-Whitney test with the level of 90% probability.

DISCUSSION: Studies show that Aquadinamic treatment method has significant effects on the pain factor results, and this study confirms these, associating the benefits of the method with the properties of water. It is known that individuals without pain have better quality of life and in this study our data converge to that. The incidence of no changes in pain, cited in this study, may be related to the number of sessions, where some studies show improvement in the pain process with greater number of sessions performed than what was performed.

CONCLUSION: The Aquadinamic method applied to the patient relating to fibromyalgia pain and quality of life factor has a significant amount of improvements and benefits, which will serve to further studies and comparative statistical evidence with a (N) larger.

PS 16

NEURO-HYDROTHERAPY IN EARLY CHILDHOOD INTERVENTION

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INTRODUCTION: Hydrotherapy is a widely used method in treating various motor deficiencies. However, in early childhood intervention it is much less prevalent. The Gezenguz Foundation treats babies and children with neurological problems and/or developmental risks (e.g. prematures) between 0-6 years of age. It provides a complex program to them to prevent or treat motoric, cognitive, and psychological problems. This contribution will offer an overview of the Neuro-hydrotherapy developed by the Foundation that plays a crucial role in the complex therapy of this age cluster.

METHODS: Neuro-hydrotherapy can be applied from birth until the stabilization of final senso-motoric patterns. It is a method developed along neurophysiological principles and according to functional demands. It always affects the motoric regulatory system that is organized on the highest level. It influences the organization of the neurosystem by activating complex movement patterns. The axis of the method is the stimulation of the vestibular system that can influence muscle tone, raise the attention level, and it creates the conditions of harmonious movement and manipulation by forming balance, coordination and postural control. It has two stages. *Under 5 months of age*, we can activate automatic, complex, elementary movement patterns by vestibular stimulation. These prefigure the final, human-specific movement patterns (rotation, sitting, crawling, walking). They produce the same muscle synergies that we find in the voluntary movement patterns later. *In this first stage we elicit these elementary movement patterns in a bathtub.* Performing it at home and on a daily basis is crucial in this early age when the development of the neurosystem is the most intensive. *Above the age of 5 months*, elementary movement patterns get transformed into voluntary movement patterns. In this second stage, *neuro-hydrotherapy takes place in a pool, mainly in group.* Using various vestibular stimulating practices we can assist the central nervous system to integrate the persisting primitive reflexes, for these can be obstacles to the harmonious development of final movement patterns, as they distort the underlying postural control. In various body positions, we can support the development of the righting and balance reactions. We apply several tools to improve head-trunk or balance control. Of particular importance is the specially designed tool called HUPLE®. It is a hemisphere which can be used both in water and on land. Children can practice the elements of balancing with it: the displacement of the center of gravity, the counterbalancing of the voluntary or unexpected swaying, and the stabilization in the midline. The therapy is usually conducted in groups which lays down the foundations for social integration.

RESULTS: At Gezenguz Foundation therapy begins after an examination done by a neurologist and a physiotherapist. Control is due every third month. Movement development is checked by the Bayley 2. test. Some children receive only land therapy. Those who participate in neuro-hydrotherapy sessions as well show better results in senso-motoric development.

CONCLUSION: Neuro-hydrotherapy can be applied independently in prevention and as an efficient part of a complex therapy in early childhood intervention.

PS 24

GAIT AND BALANCE PARAMETERS IMPROVEMENTS IN ADOLESCENTS WITH DEVELOPMENTAL DISORDERS AFTER AN 8-WEEK AQUATIC THERAPY PROGRAM

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INTRODUCTION: Aquatic interventions, including aquatic rehabilitation programs, are commonly used as a clinical environment for children with disabilities (Declerck et al., 2013). The evaluation of selected gait and balance parameters prior and after an aquatic therapy intervention could reveal information regarding the importance of aquatic therapy on assisting daily life activities involving walking and stance in children with developmental disorders. The purpose of the present study was to demonstrate the alterations in key biomechanical gait and balance parameters in a series of four case studies.

METHODS: Participants: Four adolescent males (12.5 ± 1.1 yrs; 1.60 ± 10.1 m; 57.2 ± 12.1 kg), with diagnosed developmental disorders participated in the study after the attainment of parental consent. Procedure: Participants were examined in typical gait and balance tests before and after an 8-week aquatic therapy program without the patients attending any other physiotherapeutic intervention. Intervention: Participants followed an eight-week aquatic therapy rehabilitation program. The program was implemented twice weekly. Each session had 60-minute duration. Instrumentation: The balance tests (duration = 10 sec) were executed on the 2D-DELTA Stabilometer (©: Iraklis A. Kollias). The gait analysis was conducted using ground reaction forces recorded from an AMTI OR6-5-1 force-plate (AMTI, Newton, MA) and a custom made force-plate (©: Iraklis A. Kollias). Sampling frequency was set to 50 Hz for the balance tests and 1kHz for the gait analysis. Statistical analysis: Due to the limited number of participants, descriptive statistics were utilized for presenting pre- and post-intervention differentiations in the examined biomechanical parameters.

RESULTS: Balance tests parameters were found to be improved. In detail, the medio-lateral and anterior-posterior stability was improved by 40% in the quiet stance balance test. As for the gait tests, a notable 18% faster step time was recorded. Differences were also observed concerning the timing of the instants of minimum vertical ground reaction force (+2%) and maximum vertical ground reaction force during the propulsion (+10%). The peak vertical ground reaction force at heel contact was larger after the implication of the aquatic therapy rehabilitation program (107% and 116% of body mass, pre- and post-intervention, respectively).

DISCUSSION: The findings of the present study revealed that adolescents with developmental disorders examined in the presented case studies were able to improve postural stability and to exhibit a temporal pattern comparable to healthy young adults (Kollias, 1997). The motor control acquisitions to perform the contents of the aquatic therapy rehabilitation program (i.e. static and dynamic balance tasks, walking exercises emphasizing on heel-to-toe contact) seemed to result in a better negotiation of load during gait as observed in the experimental tasks. It is of interest to investigate the long-term effects of such an intervention on a larger group of participants.

CONCLUSION: Improvements were shown in balance tasks and in walking in adolescents with developmental disorders after an aquatic therapy rehabilitation program.

PS 12

SWIMMING ACADEMY BEYOND BORDERS AQUA(E)MOTION THERAPY

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INTRODUCTION: The unique project of swimming for persons with 300 persons with physical disability involved in the program each year with four Swimming Centres - Prague, Brno, Carlsbad, Czech Budweis and it was spread through the educational program to the other 8 towns. Aqua(E)Motion Therapy and its methodology KONEV of the Kovář-Nevrkla authors and founders of the program is conceptual, continuous and methodological way of challenge from rehab to paralympics and active style of life.

Water is the environment where we bring our mission into life. Communication built on grounds of acceptance and understanding is the essential characteristics of our activity. The leading activity is water exercising therapy for disabled people called Aqua (E) Motion Therapy. Conception, continuity and methodology of the swimming programme for persons with disabilities implemented at all levels, from rehabilitation to sport level may be considered as unique. KONEV - Disability Swimming Methodology created by the Organisation's founders Martin **KOV**ář and Jan **NEV**rkla enables people with severe disabilities to move in the water without any assistance. All the fields of the Organisation's activities are built on the grounds of individual therapy. We offer adequate participation in the program for people with different aspirations, expectations and disability - swimmers are divided into three levels: I. Rehabilitation and Compensation, II. Rehabilitation and Fitness and III. Rehabilitation and Sport, thus the swimmers may participate in the programme with various frequency and intensity. We will present the methodology of teaching swimming of severe disabled (as for example tetraplegic) and we will present the results of regular long term swimming on some cerebral palsy involved into the programme as child and today already adults. Our aim is to influence the overall personality and through Aqua (E) Motion Therapy encourages self-confidence and courage in pursuing new things make own decisions; rehabilitation aspects of the active motion-in-water therapy brings increased joint range, better vital lung capacity as well as strengthened residual functional potential or a settlement of the muscle imbalance, scoliosis, prevention of pressure sores and other secondary complications resulting from a particular type of disability and diagnosis.

The Strategic Goal - 10-year horizon (up to 2020): to create conditions for Disability Swimming Lessons in compliance with the KONEV methodology all regions in the Czech Republic.

Long-term objectives - the horizon of 4 years (up to 2015): to consolidate the program in main KONTAKT bB centres - Prague, Brno, Karlovy Vary and České Budějovice in compliance with the standards required from a social service provider with potential legal autonomy of the centres; to maintain social services provided to 300 swimmers in four KONTAKT bB Centres and to prepare the programme as a “product” that would be offered those who are interested in providing swimming lessons for persons with disabilities in the Czech Republic and abroad with Complex Expert Guidance.

PS 20

STROKE TREATMENT IN HEALTH RESORTS

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INTRODUCTION: Water-based exercises are used in rehabilitation and might help to reduce disability after stroke. Thalassotherapy in Spain includes exercises in sea water and other physical and medical hydrology approaches witch might help even more to reduce disability after stroke. There is a lack of previous quality studies of Balneotherapy in neurological diseases. There are many different rehabilitation approaches to improve disability after stroke and protocols differ from country to country or even region to region.

METHODS: This is an open clinical trial (one centre, no control and randomized groups).90 patients underwent a 2 or 3 weeks program for stroke patients in a Thalasso Center in Murcia, Spain between 2010 and 2014 . Epidemiologic and fhysiological variables had been reported. Clinical variables had been tested before and after the treatment:the primary outcome variable was postural stability (Berg Balance Scale) and activities of daily living (Barthel Index). Secondary outcome variables were functional gait ability (6 min walking test) ,joins functional mobility (manual muscular test) , pain (VAS) and weelbeing index (who5).

RESULTS: There was a significant improvement in activity of daily living, weelbeing, ability to walk and postural balance but these results should be interpreted with caution because of the limitations and risk of bias of the study deign. Adverse effects were reported.

CONCLUSION:There is a lack of evidence for spa therapy after stroke. Better and larger studies are therefore required, control group is the challenge, but according to preliminary data of this study it's worth it to continue research on this thematic area. Even the adverse effects observed, spa therapy seems to be safe enough for stroke rehabilitation.

PS 25

ANALYSIS OF THE MOTIVATION FOR HYDROTHERAPY IN USERS WITH CHRONIC PAIN

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INTRODUCTION: Chronic musculoskeletal pain is a leading cause of disability. Hydrotherapy (HT), exercise and intrinsic motivation to exercise seems to be effective in pain reliever, improving function and quality of life. The self-determination theory is essential to understand the motivation that supports the maintenance and improvement of exercise in people with chronic pain. Our objective was to analyze the association between motivation and chronic pain, function and quality of life, during a three months HT program for treatment of chronic pain in adults and elderly.

METHODS: We performed a correlational study. One hundred and twenty four adults with chronic pain were enrolled in a 13-wk trial, two to three sessions per week, of a preexisting community-based HT program. Demographics were collected at baseline (83.1% female, 60.5±10.2y) and patient-reported outcomes were collected by questionnaires at baseline and after 13 wk. These questionnaires captured chronic pain -specific disease activity, function and quality of life (Quebec Back Pain Disability Scale, Western Ontario and McMaster Universities, Portuguese Short Form 12) and included instruments related to motivation to HT (Modified Behavioral Regulation in Exercise Questionnaire). A separate interview was performed at the baseline and after 3 months assessing pain (VAS for pain). Attendance at scheduled aquatic classes over the 13-week was recorded by the aquatics physiotherapists and informatics system. Pearson correlations were used to analyze the associations among behavioral regulation and all continuous variables and total assisted HT classes.

RESULTS:A moderate adherence (68%) to an aquatic therapy program, improved most of the symptoms ($p < 0,05$) on chronic pain patients. Improvement in function and quality of life was higher for people who improved motivation for HT and increased physical activity $p < 0,05$). Participants that have increased the most in relative autonomy index were the ones that improved levels of perceived mental health ($p < 0,01$). However, people with decreased pain, increased amotivation for HT ($p < 0,01$) as well as female participants reported marginally significant increases in amotivation when compared to men. The association between adherence and outcomes was consistent over time, however a small decrease in attendance was observed, while older participants were those who had more attendance.

DISCUSSION: Attendance and motivational orientation to HT have a significant effect on pain, function and quality of life with pain as the main external regulator for HT. Future research is needed to investigate the regulation style influence on HT attendance, pain and disability in a specifically pathology, stage and gender and should focus on how exercise behavior can be stimulated and maintained in the long term.

CONCLUSION: Knowing that the motivation to exercise influences its maintenance, motivational strategies should be a part of the training of healthcare providers.

PS 08

THE EFFECT OF AQUATIC VERSUS LAND EXERCISE ON PHYSICAL FUNCTION IN OLDER PEOPLE: A SYSTEMATIC REVIEW WITH META-ANALYSIS

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INTRODUCTION: Exercise has proven to be beneficial for older people and water seems to be an appropriate environment to exercise. There is no systematic review that would compare effects of land (LE) and aquatic (AE) exercise in this age group. The purpose of this study was to conduct a systematic review with meta-analysis determining the effect of aquatic and land exercise on physical function in older people.

METHODS: Medline, Pubmed, Embase, Cinahl, PEDro, SPORTDiscus, Web of knowledge were searched for relevant trials. Studies: randomised controlled trials (RCT). Population: mean age 55 year or older (not younger than 49 years old), healthy older people (without any specific health problems). Interventions: aquatic and land exercise. Methodological quality was assessed with the Delphi List and studies scoring <4 i.e. low methodological quality were excluded. In total 19 studies fulfilled the inclusion criteria and were included in the qualitative synthesis and meta-analysis. Standardized mean difference (SMD) with 95% confidence interval (95% CI) was calculated for all outcomes related to function.

RESULTS: Compared to controls AE significantly increase lower limb maximum strength 0.43 [0.03 to 0.82] and lower limb muscular power 0.70 [0.14 to 1.26]. Further produced a large sized improvement in flexibility 0.70 [0.27 to 1.13] and balance 0.84 [0.45 to 1.23]. AE had a significantly superior effect compared to land based exercise for balance 0.58 [0.00 to 1.16] and muscular endurance 0.76 [0.02 to 1.50]. No difference between AE and LE was seen for muscle strength, flexibility and aerobic fitness.

DISCUSSION: The results of the meta-analysis indicate that aquatic exercise is an effective form of exercise for maintaining and improving function in older people. When compared to a non-exercising group, aquatic exercise produced moderate to large effects on all different parameters of function. Aquatic exercise was at least as effective, and in some case more effective, than land based exercise.

CONCLUSION: Based on the results, training in water appears to be particularly beneficial as part of a fall prevention program for older people.

PS 14

THE FACTORS AND THE BENEFITS OF AN EFFICIENT INCLUSIVE SWIM PROGRAM FOR THE CHILDREN WITH AND WITHOUT INTELLECTUAL DISABILITIES: A QUALITATIVE RESEARCH IN GREECE

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INTRODUCTION: Scientific data that show the positive contribution of inclusion of children with and without intellectual disabilities (Soulis, 2008) are not consistent with the few attempts made to implement the philosophy of inclusion in the field of swimming in Greece. The purpose of this study was the emergence of the enhancing factors for an efficient inclusive swim program and the benefits from its implementation to the children as a whole.

METHODS: The qualitative research method was used for this study. The final sample, which was selected through the snowball sampling technique, consisted of 10 swimming coaches for people with disabilities from the city of Thessaloniki. The data were collected by semi-structured interviews and evaluated through content analysis. In addition, they were classified according to their conceptual relevance and finally codified for further investigation and comparison with existing studies (Iosifidis, 2008).

RESULTS: Six thematic issues emerged from the analysis of the participants' responses. The benefits of swimming for children with intellectual disabilities, the limiting factors that prevent the successful implementation of an inclusive program and the role of social attitudes towards intellectual disability were among the matters in question. Moreover, swimming coaches made some suggestions regarding ways "inclusive" swim training could be implemented. As far as the factors are concerned, coaches' views converged on many points and were consistent with previous studies. Individual factors such as children's sufficient intellectual, educational, social and athletic abilities, in conjunction with young age, contribute to a successful outcome (Conatser, Block and Lepore, 2000). The cooperation between coach and parents is another favorable factor (Conatser, 2007). Furthermore, previous professional and social experience, specialized knowledge and continuous education of the coaches contribute to an effective treatment program (Lepore, Gayle and Stevens, 2007). As far as the scheduling of training is concerned, gradual inclusion and division of the group in two sub-groups, according to time performances and adjustment (Block, 2000), as well as the presence of a second coach can play an important role. The founding of united sports clubs for athletes and coaches could also enhance athletic and social inclusion.

CONCLUSION: Regarding children with intellectual disabilities, coaches agreed that the benefits depend on each child's intellectual and social skills. At the same time, an inclusive swim program can also prove to be beneficial for children without intellectual disabilities as they can form less stereotypical beliefs regarding disability.

PS 19

AWARENESS OF AQUATIC THERAPY IN INDIAN PHYSIOTHERAPISTS AND PHYSIOTHERAPY STUDENTS

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INTRODUCTION: This study aimed to assess the awareness of Aquatic Therapy amongst Indian physiotherapists and physiotherapy students. In India aquatic therapy has not been used widely. There are very few aquatic therapy centers and certified aquatic therapists. In order to provide training in aquatic therapy and increase the availability of aquatic therapists in India it is important to assess the awareness of aquatic therapy amongst physiotherapists and physiotherapy students.

METHODS: All the practicing physiotherapists and physiotherapy therapy students were eligible to participate in the survey. Physiotherapists not currently residing in India were excluded. To assess the awareness, a structured survey questionnaire was distributed to physiotherapists and physiotherapy students in India through email. The responses were analyzed quantitatively for the percentage analysis. 775 physiotherapists and physiotherapy students in India were contacted through email for the survey.

RESULTS: 46 physiotherapists and 3 physiotherapy students responded to the questionnaire. 43% of the respondents had completed their post graduate training in Physiotherapy. The group of respondents comprised of professionals specializing in areas of cardiorespiratory, adult and pediatric neurology, musculo-skeletal physiotherapy, sports sciences and a very small percentage (6%) specializing in geriatric sciences, women's health and community based rehabilitation. 58% of the respondents had work experience of less than 5 years, 16% had an experience of 5 to 10 years and 10% had an experience of more than 10 years only 6% of the respondents were students.

93% of the respondents reported that they were familiar with aquatic therapy. 22% of the respondents were currently practicing aquatic therapy however 46% of these were using only aquatic exercises and exhibited lack of awareness of Halliwick therapy (HT), Bad Ragaz Ring Method (BRRM) and Clinical aai chi. Out of practicing aquatic physiotherapists all were aware of the relative contraindications for aquatic therapy however only 20% of these were aware of the indications for aquatic therapy. Halliwick therapy, BRRM and clinical Aai chi were not a part of graduate training for majority of respondents (82%). Halliwick therapy and Bad Ragaz Ring Method was included in the undergraduate training of 18% of the respondents, however their responses were inaccurate on the questions specific to these concepts and none of them were currently practicing these therapies. Physiotherapists were aware of the practicing aquatic therapists in their city (57%) they had prescribed aquatic therapy to their patients. Poor response rate, small sample size are the limitations of this survey.

DISCUSSION: Although 93% of the physiotherapists are familiar with aquatic therapy, there is lack of awareness of indications and contraindications for aquatic therapy and different techniques and concepts used in aquatic therapy. Aquatic therapy techniques are not a part of graduate training for most of the physiotherapists which could be one of the contributing factors.

CONCLUSION: Training protocols and workshops should aim to enhance understanding of application of aquatic therapy for various disorders and different techniques used in aquatic therapy.

PS 04

AQUATIC THERAPY IN INDIA - AN INSIGHT TO UNDERSTAND OBSTACLES AND STRATEGIES FOR AWARENESS (DESCRIPTIVE RESEARCH)

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INTRODUCTION: Any Concept new to a region needs a systematic approach to understand need, resources, infrastructure and the ability to sustain in the long term. Therapeutic concepts are not exceptional.

Aquatic therapy in India is on the rise, and needs support. Physiotherapy is a fast growing profession in India and has been getting recognition from general population & Aquatic therapy being one of the approach needed due recognition. The health care for vast population has given rise to many specialities of clinical approaches from ancient and traditional Ayurveda to Naturopathy. Understanding the advantages of water and the therapeutic benefits one can obtain, an attempt is being made in to bring awareness to public and professionals about Aquatic therapy. This required understanding the obstacles and overcoming them one by one.

METHODS: Data were collected through online search and telephonic interview on following details to observe the awareness of aquatic therapy. Educational hours and topics on aquatic therapy at undergraduate and postgraduate level in various Physiotherapy colleges. Identifying presence of pools. Willingness among patient population to try aquatic therapy.

RESULTS: India was divided into four zones to obtain cluster sample for collecting data of educational hours (Basics - Definition, Principles, Indications, Contraindications, Types of Hydrotherapy, Advantages & Benefits). Pools were present in all the zones of India, South Zone had more Pools as compared to North. Patients were willing to attempt the new therapy in all zones after telephonic interview and information through colleagues. The factor responsible for lack of growth of aquatic therapy in India was mostly associated with the following factors: (1) Lack of education amongst physiotherapists; (2) Lack of awareness among general population and (3) Infrastructure was present, but mostly used for recreation and swimming.

Table 1: Physiotherapy Colleges Data

Zone	Government Physiotherapy Colleges	Private Physiotherapy colleges	No. of Hours allocated	Topics
North	5	54	3	Basics*
South	4	75	3	Basics*
East	3	7	No Specific Hours	Basics*
West	6	42	No Specific Hours	Basics*
Total Colleges	18	178	3	Basics*
	196			

DISCUSSION: In order to facilitate the growth of aquatic therapy based on above findings the following steps are being taken. Initiated an education program for Physiotherapists constituting of 16 hours since 2006, which was redesigned to 32 hours (one day clinical hands on) program by 2014 after essential training and education from Klinik valens; More than 200 therapists are trained till date. Public awareness program through Radio talks at local level & a series on aquatic therapy articles in Physiotimes a national magazine for physiotherapists reaching almost 3000 therapists and more thru online publication. Talks in conference at national and state level increased the level of awareness to a larger population including medical professionals who are willing to refer patients to aquatic therapy.

CONCLUSION: Understanding the need, demand, infrastructure and awareness will give us a clear indication to develop an action plan for spreading the work of aquatic therapy and reach the patient population. Training by a recognised education body is mandatory to educate the concepts of aquatic therapy. Observation of basic aquatic education of the nearby countries or international aquatic bodies will be a worthwhile guidance for designing aquatic syllabus.

PS 30

THE WATER PROJECT: WHICH AQUATIC EXERCISES WORK BEST? IDENTIFYING MUSCLE RECRUITMENT FOR EXERCISES USED IN CORE STRENGTHENING AND REHABILITATION PROGRAMMES

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INTRODUCTION: Musculoskeletal disorders (MSDs) such as low back pain (LBP) are a main cause of disability, suffering and absence from work (1). With research showing aquatic exercise to be effective in rehabilitation and core strengthening, a key issue arising is identifying which exercises should be used in aquatic programmes that focus on trunk supporting muscles. To maximise programme effectiveness and efficiency it is vital that the exercises target directly the muscles of interest. Muscle activation can be quantified through electromyography (EMG), which, combined with video analysis, would identify the extent to which muscles are activated during each phase of an exercise. The aim of this study is to quantify the activation of the main trunk supporting muscles for a range of aquatic and land exercises commonly used in rehabilitation and strengthening programmes of people with LBP, as well as populations relatively restricted in the use of land exercises, such as pregnant women, the obese and elderly. The study aims to explore muscle activation for the different phases of each exercise and to identify any asymmetries in activation between dominant and non-dominant sides. A final aim is to identify any differences in the physical effort and perceived exertion between exercises.

METHODS: Two groups of participants (N=20/group, 18-45 years old) will be recruited for this study. One group will be consisted of healthy participants, free from injury and illness, with low body fat percentage (<20%) to facilitate surface EMG, and with no history of MSDs or previous exposure to aquatic rehabilitation. The second group will be a homogenous group of non-specific chronic LBP participants (with LBP for >3 months), with no previous exposure to aquatic rehabilitation. The following exclusion criteria will be applied for the latter group: acute CLBP; specific CLBP (i.e. with a diagnosis or known pathology); patients with operations or any “red flag” conditions (e.g. cancer, infection, inflammatory conditions, fractures); score higher than 60 in the Modified Oswestry Low Back Disability Questionnaire. A range of aquatic and land exercises will be tested through EMG and 3-D video analysis. EMG will be applied on the main trunk supporting muscles, such as the external oblique, rectus abdominus, lower abdominals (transversus abdominus/internal oblique), erector spinae, multifidus, gluteus maximus and medius. Both sides of the body will be tested. Appropriate maximal voluntary contraction exercises will be used when appropriate to normalise the EMG testing data. Outcomes: The mean, peak and integrated EMG data will be calculated and normalised to the highest MVC value for each muscle and for both sides of the body. Phases of different exercises will be also analysed where appropriate. Heart rate and ratings of perceived exertion will be recorded as indicators of exercise intensity and perceived exertion.

RESULTS: Preliminary findings from pilot and/or experimental data from this study will be presented and discussed at the conference.

PS 18

THE ADDED VALUE OF WATER FOR SWIMMERS WITH DOWN SYNDROME

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INTRODUCTION: Aquatic exercise has specifically been shown to offer benefits for people with intellectual disabilities in terms of cardiorespiratory endurance, muscular endurance, speed, static balance, and agility (Yilmaz et al. 2009; Fragala-Pinkham et al. 2008). However, even if physical activity and sport are meaningful to many people, including those with intellectual disabilities, studies in trained individuals are scarce (Van de Vliet et al. 2006). The purpose was to evaluate the effect of swimming training and competition on the body composition and physical fitness profile in persons with Down syndrome.

METHODS: The Eurofit Special test, a physical fitness battery designed for persons with intellectual disabilities, was applied to six trained swimmers with Down syndrome in two different moments (January 2011 and November 2014). In addition, body measurements were taken to Body Mass Index (BMI) and Lean Body Mass (LBM) determination. Statistical procedures were performed with IBM SPSS Statistics 19 for Windows. Non-parametric tests (related samples) were used due to the small sample size.

RESULTS: The six swimmers were $18,7 \pm 5.4$ years in 2011 and 22.8 ± 5.2 years in 2014. Results for hours of training a week, anthropometrics (weight, height, skinfolds sum, Body Mass Index - BMI -, Fat %, Lean Body Mass - LBM), and Eurofit Special (long jump, medicine ball, sit-ups, speed, flexibility, and balance) are presented on Table 1. Significant differences were found in hours of training a week, height, and the medicine ball.

Table 1. Descriptive statistics and absolute difference between the results in the second and first evaluation moments (2014 and 2011).

	Mean \pm SD 2011	Mean \pm SD 2014	Absolute difference (2014-2011)
Hours training/week*	9.8 \pm 3.5	11.7 \pm 4.1	1.8 \pm 1.3
Weight (kg)	56.5 \pm 8.9	55.4 \pm 10.1	-1.0 \pm 8.5
Height (cm)*	148.3 \pm 6.5	153.0 \pm 8.5	4.7 \pm 3.8
Skinfolds Sum (cm)	58.7 \pm 21.9	42.7 \pm 14.5	-17.7 \pm 19.2
BMI	26.4 \pm 4.8	23.6 \pm 2.3	-2.8 \pm 4.2
Fat %	24.4 \pm 8.7	20.6 \pm 7.0	-4.4 \pm 4.4
LBM (kg)	42.7 \pm 8.1	44.2 \pm 10.5	1.8 \pm 5.0
Long Jump (cm)	86.7 \pm 26.3	108.3 \pm 33.9	21.7 \pm 44.6
Medicine Ball (cm)*	309.5 \pm 91.5	418.3 \pm 116.5	108.8 \pm 85.2
Sit-ups	17.2 \pm 2.3	17.8 \pm 1.5	0.7 \pm 3.8
Speed (s)	5.9 \pm 0.7	5.9 \pm 0.7	0.0 \pm 0.5
Flexibility (points)	32.0 \pm 2.4	32.5 \pm 1.2	0.5 \pm 1.2
Balance (points)	5.2 \pm 0.4	5.3 \pm 0.5	0.2 \pm 0.4

*Statistical differences for $p \leq 0.05$.

DISCUSSION: Persons with Down syndrome are considered to have higher BMI and lower levels of LBM (Gonzalez-Aguero et al 2010) than persons without Down syndrome. In the present study swimmers had an inferior BMI, Fat %, and a higher LBM values in 2014. In fact, in 2014 these swimmers are included in the normal weight category (18.5-24.9), accordingly to the World Health Organization (1995) classification. This did not happen in 2011. Also, in 2014 swimmers presented improvements in all physical fitness items, with exception for speed. Greater differences in flexibility, balance, and abdominal strength were not expected. One possible explanation for these improvements can be the augmented hours of training per week. Swimmers train every part of their body in the water, and this can improve their physical fitness (especially strength) and body characteristics.

CONCLUSION: Some changes in Eurofit Special test results and anthropometric variables over time were not statistically significant perhaps due to the small sample size. The changes found do indicate considerable improvements in body shape as well as in upper and lower body strength. *Supported by FCT SFRH/BD/78513/2011*

PS 26

AQUATIC CIRCUIT TRAINING INCLUDING AQUA CYCLING IN PATIENTS WITH KNEE OSTEOARTHRITIS - A FEASIBILITY STUDY

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INTRODUCTION: Physical exercise is a cornerstone in the treatment of osteoarthritis (OA) (1-3). However, exercising under normal conditions of gravity can be difficult and painful for patients with OA. In this case aquatic therapy offers several benefits over land-based therapy. Aqua cycling might be easy to learn, acceptable, and safe to perform for patients with knee osteoarthritis (OA). The present study aims to evaluate the feasibility of an eight-week aquatic circuit training in terms of adherence, possibility to progress in exercise level, occurrence of adverse events, operational aspects and patient acceptance.

METHODS: A feasibility study using quantitative (pre-post) and qualitative (cross-sectional) assessments. Population: A volunteer cohort of ten participants (women = 7) between 46 to 77 years with knee OA. Intervention: Participants trained in small groups of maximal three participants, once a week for 45 minutes over an eight-week period. The training was executed in a heated therapy pool (32° C), supervised by a physiotherapist. The circuit training comprises aqua cycling, functional exercises like stepping and chair stands, ROM and strength exercises. Gait exercises were done as a warm-up and cool-down. Outcomes: Focus group interviews explored participants' experience with the training. Furthermore, pre- and post-exercise knee pain, attendance, progression in training and adverse events was registered. The analysis of the focus groups was guided by the steps of framework analysis for descriptive accounts. The raw data was summarised using the questions from the interview guide and recurring themes. The Wilcoxon signed rank test examined differences in pre- and post-exercise scores of knee pain.

RESULTS: 70% of the patients attended all sessions. Focus groups revealed high satisfaction with the selection of the exercises and participants valued the immediate pain relief. Pre- and post-exercise pain measured on a numeric pain rating scale showed a one-point reduction of knee pain.

DISCUSSION: Participants progressed well, only aqua cycling in an out-of-the-saddle position was too demanding for most participants. An aquatic circuit training including aqua cycling seems feasible for patients with knee OA. Participants highlighted the pain reduction and were positive about the diversified exercise programme.

CONCLUSION: Aqua cycling in a seated position is a safe and controlled movement.

PS 10

RESULTS OF AN AQUATIC EXERCISE PROGRAM ON BALANCE, RISK OF FALLS, FEAR OF FALLING AND QUALITY OF LIFE IN OLDER ADULTS, DURING 12 WEEKS

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INTRODUCTION: Aquatic Exercise is widely used in older adults as a preventive and therapeutic aid for several health issues¹. It presents a secure activity, less prone to falls and with good acceptance and adherence to treatment, and it has been the subject of investigations regarding balance recovery in this population^{2,3}. Therapeutic exercise in water has an important role in preventing, maintaining and improving the functionality of older adults^{4,5}. The purpose of this study was to assess the impact of an Aquatic Therapy program on balance, risk of falls, fear of falling and health-related quality of life (HRQOL) in older adults and if this program effects will be different in function of the gender.

METHODS: Subjects (N=187, 128 women, 60-86 years) participated in a quasi-experimental pre/post study with a control group, in two swimming pools (intervention group n=142) and in an elderly university (control group n=45). The outcomes evaluated were balance, risk of falls (Berg Balance Scale⁶; Timed Up & Go Test⁷), fear of falling (Falls Efficacy Scale⁸) and HRQOL (SF-12v2[®] Health Survey⁹). The subjects underwent a 12-week Aquatic Exercise program for balance (two 40-minute weekly session), in groups of 10-15. Each session was divided into three phases: aquatic environment adaptation and warming up phase, a fundamental phase with balance exercises and a cool down and stretching phase. The subjects were reassessed after the twelfth week of the Aquatic Exercise program.

RESULTS: The Aquatic Exercise program promoted increases in subjects' balance, HRQOL, decreases in fear of falling (all $p < 0.001$) and risk of falls ($p < 0.01$), in comparison with the control group. In function of the gender, it was found significant improvements in balance and in physical domain of the HRQOL (all $p < 0.01$) in female participants in comparison with men of the intervention group.

DISCUSSION: This study indicated that this Aquatic Exercise program promoted increases in balance and a reduction in the risk of falls among older adults, as well as lower levels of fear of falling and better levels of HRQOL. Aquatic Exercise is a physical therapeutic resource to be considered for recommendation for preventing falls among older people. Future research is needed to determine the effect on incidence of falls, adequately address the issue of maintenance and using different lengths of participation to determine if there is an optimal time frame and frequency for improvement.

CONCLUSION: Aquatic Exercise is a recommended physical therapeutic resource for fall prevention among older adults.

PS 03

RESPONSE TO EFFORT DURING WALKING ON SOIL AND IMMERSION IN PEOPLE WITH DUCHENNE MUSCULAR DYSTROPHY - CASE SERIES

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INTRODUCTION: Hydrotherapy aims to minimize the deconditioning, muscle/ tendon shortenings, retractions and deformities in patients with Duchenne Muscular Dystrophy (DMD). However, it is necessary to clarify the impact of the induced effort. The objective of this study was to analyze and compare the intensity of induced effort in patients with DMD during the six minutes walking test (6MWT) on soil and immersion.

METHODS: Case series of 6 patients diagnosed by DNA analysis (13 SD 2.8 years, score on Vignos scale 1.8 SD 0.8 and on MFM of 87.4 SD 6.8). The exercise intensity was evaluated on 2 consecutive days. On the first day we used the 6MWT and on second, during immersion at the xyphoid process level. Serum lactate (LA) was measured with Accutrend®. The Borg scale (BS) was used to assess reported effort. For clinical safety the heart rate (HR), oxygen saturation (SaO₂) and blood pressure (BP) were measured. McDonald¹ recommendations based on the American Thoracic Society (ATS) were used².

RESULTS: The comparison between the performance on the 6MWT on soil and immersion showed differences in HR, BS and LA. The mean distances covered on soil and immersion was respectively 267.1 dp 41,3m and 94.0 dp 12,0m. The mean score on the BS on soil, in the pre and post test was 0.83 SD 1.60 and 2.33 SD 2.25. During immersion, the mean score on BS in pre and post tests were 0.16 SD 0.40 and 2.5 SD 2.6. The mean LA on soil, pre and post test was 4.16 and 4.31 SD 0.56 mmol dp 0,78mmol. The mean LA during immersion in the pre and post test was 5.01 SD 0.93 mmol and 4.38 SD 0.62 mmol. The SaO₂ and BP remained stable, with an increase in HR during the tests, as expected.

DISCUSSION: Walking in immersion imposes greater resistance to progression due to the viscosity. This results in decreased distance on 6MWD, but with low intensity effort observed by LA and BS score. The speed during immersion is influenced by the buoyancy, which leads to reduced load of body weight and reduces the vertical compression on joints, offering less musculoskeletal overhead. The reduction of LA, after the test, is due to the response of oxygen saturation during recovery, associated with a reduction in the rhythm of the activity³.

CONCLUSION: The intensity of effort during walking in immersion was lower than that on the ground, as indicated by the LA, BS score and HR.

PS 17

THE EFFECTIVENESS OF AN INTENSIVE HALLIWICK THERAPY IN CHILDREN WITH DAMAGED CENTRAL NERVOUS SYSTEM

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INTRODUCTION: Aim of our study was to determine the effectiveness of an intensive Halliwick and hydro specific therapy. Our goal was to achieve progress in land based physical function and adaptation to water.

METHODS: The participants of this study were 3 kids (aged between 5-7) who received treatment at our institute for five consecutive days (Monday to Friday) consisting a 45 minute individual Halliwick therapy. Child "A" was 5 years old suffering from spastic paraplegia with severe scoliosis and using canes for walking. Child "B" was 7 years old flaccid tetraplegic with no functional use of his left hand. Child "C" was 6 years old with spastic paraplegia uses canes for walking. We have done assessments on the 1st and 5th day measuring the Time up and go test, Functional reach test forward and side and the 3 minute walking test on dry land; in the water we recorded the WOTA 2 test. The therapy consisted mental adjustments, strengthening the trunk (SRC, TRC, LRC, Combined RC), standing stability tasks and individually specified functional therapy for each kid.

RESULTS: Results showed progress in all 3 children which were also noticeable in their daily activity. Child "A" showed progress in the functional reach test with 142%; the initial help he needed for the knee extension and the stability of the pelvic disappeared, by the end of the week. The WOTA 2 test changed from 22% to 35%. Child "B"-s functional reach test progressed with 104%; the 3 minute walking got better with 142%. WOTA 2 test changed from 17% to 55%. By the end of the study he started using his left arm even at home. In the water he was able to reach for objects with his left arm, hold them in his hand; the elbow was able to do flexion and extension against resistance, muscle strength increased significantly. He was relived in the water and had no fear towards new situations. Child "C"-s time up and go tests initially was 28 seconds in which she kept falling; by the end of the week it got down to 19 seconds. In the functional reach test she achieved 168% better. By the end of the week she did not needed aid for the stability of the pelvis. In the 3 minute walking test she achieved 179% better. WOTA 2 test progressed from 58% to 72%. Standing stability also increased. By the end of the week she was able to stand up and sit back on her own in ankle height water level.

CONCLUSION: The effect of the 5 day Halliwick therapy made changes in mobility function both on land and in water. A weekly treatment complimented by the intensive Halliwick therapy has achieved better results which later on stayed and given the basics for a future treatment.

PS 13

SETTING GOALS IS THE GOAL

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INTRODUCTION: According to the International Classification of Functioning, Disability and Health (ICF) model and current rehabilitation concepts, aquatic therapists are expected to set functional goals for patients in order to achieve maximal participation in the community and daily living.

While the patients are treated in a different environment, the water, parallel goals can be set: land goals and aquatic goals. In order to set aquatic treatment goals, aquatic therapists need to receive information regarding each patient's land based functional measures in addition to assessing the patient's functional level in the water. The main purpose is to bring the patients to their best functional level in both environments.

The Halliwick Concept, developed by James McMillan in 1949, is one of the leading approaches to aquatic therapy specifically in neurology and pediatrics. It includes a ten point program based on a motor learning sequence that focuses on postural control. Ten successive steps lead the swimmer, with or without disabilities, to experience and master a variety of movement patterns, culminating in functional swimming.

Water Orientation Test Alyn (WOTA) 1 and 2 were developed based on the principles of the Halliwick Concept. The tests were found to be valid and reliable and show that both are appropriate tools to track change over time. The WOTA has been used in evidence based studies and aquatic therapy worldwide for over 10 years.

The tests enable the therapist to evaluate the patient's mental adjustment to the water and to receive information on all domains of the ICF. These include body function and structure as well as activity and participation levels in the aquatic environment. From this information, the therapist can set relevant goals for each patient.

The main goal of this presentation is to show how aquatic therapists could utilize the items of the WOTA, in addition to land based measures, to set treatment goals that can be divided into three categories: 1. Goals in the domain of body structure and function that are similar in the water and on land (eg. strengthening, improving range of motion); 2. Activities that can be performed in or out of the water (eg. walking, jumping) and 3. Aquatic activities that lead toward aquatic participation (eg. rotation control that lead to swimming). Once the goals are set, the WOTA can be used to follow the patients' progress.

PS 31

EARS DRIVE HANDS: SONIFICATION OF LIQUID EFFECTS INDUCED BY AQUATIC SPACE ACTIVITIES CONTRIBUTES TO COGNITIVE REPRESENTATION

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INTRODUCTION: Aquatic Space Activities (ASA) as self-induced cyclic motions in water under the condition of limited energy reservoirs, induce pressure changes, resulting in buoyancy and momentum changes of water mass is controlled by cognitive act of information transformation performed by a behavior directing system. Effects of momentum changes of the surrounding watermass can be divided in resisting and propulsive effects. Instructors often report that novices executing ASA, including head-above-water, get exhausted quickly. One reason might be that the water motion is perceived improperly and e.g. a tapping like hand motion is executed too forcefully. However, the communication about what is appropriate is difficult. Optimal ASA behavior demands polymodal sensory integration and according to Effenberg (2005) the auditory information is an essential channel. Listening to the water-motion induced by hand-water-interaction is possible when using sonification, which is a means to transfer any non-acoustic signal to sound (Herman et. al., 2012). Although the neurobiological mechanisms that mediate the behavioral effects of corresponding auditory effect stimuli are unknown, sonification might have a potential to enhance accuracy of existing motion perception as well as motor control. This may aid the person with no talent for feel of water to execute ASA more properly. Via real time sonification movement perception can be enhanced in terms of temporal precision and multi-channel integration. Resulting movement sounds contain structural analogies to visual and internal sense organs and haptic percepts enabling the tuning of the multimodal perception, including audio-proprioceptive integration. The goal is to introduce the setup of real time measuring pressure changes and sound production while executing ASA.

METHODS: The unsteady flow effects due to hand-water-interaction are quantified via Piezo-probes (2 per hand) which were connected to pressure sensors. A SuperCollider program transformed the pressure-differences into functional sounds presented via in-ear loudspeaker as feedback. Action and sound were videotaped simultaneously. Two event-based parameter-mapping sonification schemes are selected. The study of real-time sonification focused on the symmetry between right and left hand while executing hand-water-interaction in head-out-position.

RESULTS: The quality of the real-time aspect was checked quantitatively. The time lag from the first action of hand and sound heard via loudspeaker was $0,123 \pm 0,027$ s. The delay of 123 ms is not far from reaction threshold of sportive actions. A questionnaire revealed that the two sounds did not create negative emotions while the persons agreed to become familiar with the sounds and the likeliness to rehearse over longer periods with sonification of the pressure data was "fully agreed".

DISCUSSION: A failure to produce a normal movement pattern is not just a sign of a dysfunction in "motor programming" or movement execution when taking a somatosensory origin of motor symptoms into account, e.g. an improper motor-efference-copy mechanism dealing with predicted sensation of self-produced motor acts.

CONCLUSION: The Piezo-probe based tool for sonification of ASA can be advised as a major step to enhance perceptions of effects of unsteady flow and it may be quite useful in designing behavioral therapies aimed at intervening sensorimotor integration and control.

PS 33

EARLY AQUATIC INTERVENTION FOR CHILDREN WITH AUTISM SPECTRUM DISORDERS

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INTRODUCTION: The severity of autism spectrum disorders (ASD) in children is demonstrated by impaired social communication and restricted, repetitive patterns of behavior (American Psychiatric Association, 2013). Children with ASD also have difficulty in maintaining eye contact, participating in social games, making friends, turn-taking and reciprocal conversation, and engaging in physical activity (Pan & Frey, 2006; Reid, 2005). These failures and disadvantages of children with ASD could predispose them to a lower physical activity level and limited participation in leisure skills such as physical activity and sports programs (Lee & Porretta, 2013). According to the results of some studies, children with ASD have a lower physical activity level than peers without ASD during their weekly routine (Pan & Frey, 2006; Reid, 2005). Some authors have stated that many children with ASD enjoy and are successful in movement skills in aquatic settings (Huettig & Darden-Melton, 2004; Killian, Joyce-Petrovich, Menna, & Arena, 1984; Prupas, Harvey, & Benjamin, 2006; Yilmaz et al., 2004). A number of researchers have used an aquatic intervention in order to develop physical performance (Fragala-Pinkham et al., 2010), learning (Rogers, Hemmeter, & Wolery, 2010; Yilmaz, Konukman, Birkan, & Yanardag, 2010), behavior (Yilmaz et al., 2004) and social outcomes (Pan, 2010) for children with ASD. Although these positive effects, aquatic intervention is not enough embedded into their weekly routine owing to lack of information of the therapist, aquatic specialist and families about effective teaching strategies and management behavior, and other reasons. These presentation focuses on the factors to carry out the aquatic intervention with smoothly by them.

PS 09

COMPARISON OF THE EFFECTS OF LAND-BASED AND WATER-BASED EXERCISES ON FUNCTIONAL CAPACITY AND QUALITY OF LIFE IN GERIATRIC AGE GROUP

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INTRODUCTION: The severity of physiological decline along with the functional loss can be reduced by increasing physical activities on geriatric age group. Hydrotherapy provides mobile ability while providing a safe and enjoyable environment. Therefore it is motivating and effective environment for the geriatric age group.

METHODS: This study was carried out to compare the effects of land-based and water-based exercises on functional capacity and quality of life in geriatric age group. 31 individuals in the geriatric age group participated in the study. Participants were divided into two groups, based on their preference, as the pool exercise group consisting of 15 persons (group 1) and the land exercise group consisting of 16 persons (group 2). In the first week of the study, a participant from group 2 left the group. A 6-week exercise program consisting of 3 days per week was scheduled for both groups. Functional assessment tests (functional reach test, standing on one foot with eyes open and closed, timed up and go, Borg scale, muscle testing, and 6 minute walking test) were performed and a quality of life questionnaire (*WHOQOL-OLD*) was administered to all individuals before and after the exercise program.

RESULTS: Positive effects of exercise was observed in both groups ($p < 0.05$). Total scores of quality of life and the results of the functional capacity scales revealed the fact that pool or land environments showed no difference in terms of the effects of the exercise on quality of life and functional capacity in the geriatric age group ($p > 0.05$).

DISCUSSION: Bento's study revealed the benefits of water exercises on muscle improvement. (3). Douirus observed similar effects on balance after water and land based exercise periods (4). These results were confirmed by our findings. Our results also confirm the fact that exercises improve the quality of life of the elderly.

CONCLUSION: Pool or land exercises performed at sufficient level and with reasonable loading will provide similar efficiency to improve the functional capacity and quality of life on geriatric age groups. Elderly people may benefit from the proprioceptive input provided by water on the skin surface as well as from the safe environment if there is a suitably equipped pool.

PS 02

AQUATIC PHYSIOTHERAPY IN PERIPHERAL NEUROPATHIES: A STANDARDIZED REHABILITATIVE PROTOCOL

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INTRODUCTION: Gait, balance and painful disorders represent the main disabilities affecting patients with peripheral neuropathies and can highly compromise the activities of daily living. Aquatic therapy is a cutting-edge rehabilitative approach for different types of neurological diseases, but it has no widely approved protocols (1-2). Aim of our study is to develop a standardized rehabilitation program for peripheral neuropathy, composed by exercises that would be practicable both in water and on land.

METHODS: Functional Independence Measure, Berg Balance Scale, Functional Ambulation Classification, Overall Neuropathy Limitation Scale and Visual Analogue Scale pain scores are assessed in patients affected by peripheral neuropathy. Patients able to walk (even if with assistance) start a 4-weeks rehabilitation program that includes 12 sessions (3/week) of front-to-front exercises in a heated (32°C) swimming pool and daily on-land physiotherapy (front-to-front, treadmill, cycloergometer, cyclette). In-water sessions are 30 minutes long and composed by the following steps: 1- Water familiarization, relaxation and breath control. 2- Balance and posture control exercises: objects pushing with the four limbs; weight shifting with open/closed eyes and with water turbulence; sitting on floating bars and moving the four limbs; kneeling down and pushing down objects; standing up; postural changing. 3- Gait exercises: one-foot loading and step phases training; assisted walk; walking forward, backward and sideways, with open/closed eyes; obstacle walking; dual task walking (with arms exercises). At the end of the program, the scores of the abovementioned scales are reassessed, in order to evaluate the improvement of the motor skills in each patient.

DISCUSSION: Peripheral neuropathies of different etiologies are quite common in the population. Standard physical therapy can improve the associated gait disorders, but it doesn't seem to act on neuropathic pain. Currently there are no evidences in the literature regarding the effectiveness of an aquatic physiotherapy on the symptoms of patients affected by neuropathy, and indeed there are no standardized hydrotherapy programs for any neurological disease. Anyway the warmth and buoyancy of water facilitates muscle relaxation and seems able to block nociception by acting on thermal receptors and mechanoreceptors (3-4). Furthermore, some studies revealed a good effect of hydrotherapy on gait and balance in different types of neurological diseases (5-6). Thereby we think that a good aquatic physiotherapy would be more effective on neuropathic symptoms than on-land physical therapy alone, and the development of a standardized approach is the basis of every effectiveness study.

CONCLUSION: A standardized rehabilitative program as the one that we described would be particularly valuable for future studies about efficacy of aquatic physiotherapy (compared to on-land exercises) on gait, balance, pain and quality of life in patients with peripheral neuropathy.

Poster presentations

Alphabetical by first author, presenting author is underlined, program number is indicated

POST27

BONE MINERAL DENSITY OF THE FOREARM IN ELITE SWIMMERS AND WATER POLO PLAYERS

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INTRODUCTION: The aim of the present study was to compare and determine the effects of swimming and water polo training (as non-weight-bearing sport) on Bone mass of forearm in elite male swimmers and water polo players, and examine whether skeletal adaptation to chronic of Swimming and Water polo training on bone mass health. Swimming and water polo, as a non-weight-bearing sport, has been considered to be insignificant in the maintenance of bone mass. However, the action of such water sport on bone turnover remains unclear.

METHODS: Twenty-five male swimmers (age 20.7 \pm 0.89 years) training for 12-15 hours/week; compared with 25 water polo players (age 21.1 \pm 0.8 years) training for 10-12 hours/week, and 25 sedentary healthy subject as a control groups (age 21.3 \pm 1.03 years). The groups were matched for age, height, and weight. BMD (g/cm^2), BMC (g), and Area (cm^2) of the Forearm were measured using dual-energy X-ray absorptiometry (DXA).

RESULTS: There were significant difference between Athletes and control group in BMD, BMC and Area. The significant observation in this study indicates that water polo players showed a greater in forearm bone mass, BMD of water polo was significantly ($p < 0.0001$) greater than swimmers (0.85 ± 0.63 vs. 0.69 ± 0.48 g/cm^2), BMC (21.2 ± 1.7 vs. 18.1 ± 0.71 g), Area (30.7 ± 1.73 vs. 25.8 ± 1.7 cm^2).

DISCUSSION: Participation in Water exercise training may enhance BMD, BMC, and Area of Forearm in male, water polo playing may be preferable over swimming for maintaining bone mass and health.

CONCLUSION: These positive effects suggest the brisk non-weight-bearing water exercise can be considered as a useful activity for estrogenic stimulus and can be an effective non-pharmacological intervention for the adults and adolescents. Further research are needed to determine the impact of other aquatic sports on bone health for subjects with disability.

POST02

EFFECTS OF WATER EXERCISE ON AEROBIC AND FUNCTION ABILITIES AT CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

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INTRODUCTION: Motor disorders in cerebral palsy (CP) are often accompanied by disturbances in sensory feelings, perception, cognition, communication, behavior, as well as epilepsy and secondary musculoskeletal problems (Rosenbaum et al., 2007). CP is classified as a dynamic disability, because physical activity and exercise can change the physical condition of a person with CP (Lockett & Keyes, 1994). Diagnosis and early treatment are important in the rehabilitation of children with CP. The aim of this study is to determine the effects of water exercise on aerobic capacity and functional status at children with CP.

METHODS: PubMed/Medline, PEDro, SCIndeks, DOAJ, SPONET, и Hrčak controlled trials register were searched for relevant trials from 2000 to 2013. Studies: longitudinal studies. Population: children with CP aged from 7 to 10. Interventions: active water exercise. Outcomes: Cardiovascular fitness, flexibility, balance, strength. Key words: cerebral palsy, disability, children, physical activity, sports activity, aerobic endurance, function.

RESULTS: The collection of studies based on keywords identified 553 studies. Total number of studies that are immediately excluded were based on title, duplicated studies, the period of issue (issued before 2000) is 538. Further selection of 15 studies, excluded 10 of them on the basis of the following criteria: abstract, type and age of the study (subjects younger than 7 or older than 10). The remaining five studies met the set criteria.

DISCUSSION: A total of 46 subjects were involved in studies. The largest number of subjects (n = 19) was in the study Dimitrijevic et al. (2012) and the lowest (n = 1) in the study Retarekar et al. (2009). Subjects in all five studies had spastic diplegia (the type of CP) and in one study (Dimitrijevic et al., 2012) beside spastic diplegia and hemiplegia. In two studies (Dimitrijevic et al., 2012; Jeng et al., 2013) exercise program lasted 12 weeks with a frequency of two sessions per week. The study Retarker et al. (2013) had exercise program with a frequency of three sessions per week. In the study Fragala-Pinkham et al. (2013) exercise program was the longest - 14 weeks with two sessions per week. In four sessions (Jorgić et al., 2012; Dimitrijevic et al., 2012; Fragala-Pinkham et al., 2013; Jeng et al., 2013), participants were divided into two groups (experimental and control). In three studies, each session lasted 45 minutes (Jorgić et al., 2012; Dimitrijevic et al., 2012; Fragala-Pinkham et al., 2013), 40 to 60 minutes in one study (Retarekar et al., 2009), and the longest duration of the session was 60 minutes (Jeng et al., 2013). In the studies was used an interval aerobics program, a strength training program and standardized training program for aerobic capacity.

CONCLUSION: Water exercise program in children with CP as a treatment affects their motor functioning state in the form of improved aerobic capacity and motor functions.

POST37

THE PHYSICAL AND SCAR-RELATED EFFECT OF SHORT TERM HYDROTHERAPY IN AN ADULT BURN POPULATION: A PILOT STUDY

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INTRODUCTION: Hydrotherapy is a well-known method in the treatment of various diseases such as musculoskeletal, neurological, cardiovascular and pulmonary disorders [1]. But in the rehabilitation of burn injuries, its efficacy has never been assessed. In this comparative study, we aimed to investigate the effect of scar-related local treatment (passive hydrotherapy) to physical activity in water (active hydrotherapy) and these compared to the usual care therapy in an adult burn population.

METHODS: The study design was a non-randomized controlled trial. Patients were allocated into one of three groups either completing a three week treatment in a spa resort (passive form of hydrotherapy) in Avène (France) or three weeks of aquatic exercise (active form of hydrotherapy) in Leuven (Belgium) or only the usual care therapy without additional hydrotherapy. Both intervention groups continued the usual care therapy during the hydrotherapy intervention. In total 42 patients were recruited from the Belgian Burn Centers and agreed to participate in this non-randomized clinical trial with fourteen patients in each intervention group. Outcome measures (physical and scar-related parameters) were assessed at baseline, during the 3-week intervention and at follow-up until 3 months.

RESULTS: In the aquatic exercise group (AHT) a significant increase in hand grip strength was shown. In the passive hydrotherapy group (PHT) hand grip strength decreased temporarily during the 3-week intervention and returned to normal again at 3-month follow-up. There were significant improvements in redness and POSAS observer vascularity score over time in all groups, although there was a temporary increase of redness and vascularity score during the 3-week intervention in the PHT group. A significant lower itching score in the PHT group was found during the 3-week intervention.

DISCUSSION: AHT patients were willing to participate in an aquatic exercise training program, although only few changes were observed because of the short intervention length. In addition to the temporary increase of scar redness during the intervention, PHT patients showed some reduction in short term itching problems.

CONCLUSION: We can conclude that even the small changes observed in some physical and scar related parameters are promising and more research in this field is needed. In practice we recommend a selection of therapy based on the individual problems and conditions of patients. So far, pressure and silicone therapy are the only evidence supported treatments in burn scar after care. But we believe that hydrotherapy can offer some added value to the current usual care therapy and rehabilitation programs of burn patients.

POST33

HYDROTHERAPY - AQUATIC REHABILITATION FOR SOLDIERS AND CIVILIANS INJURED IN THE GAZA CONFLICT.

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INTRODUCTION: Sheba Medical Centre staff provided rehabilitation for patients injured in the recent Gaza conflict. Over 100 Israeli soldiers were injured during the war between Israel and Hamas and transferred to our specialist rehabilitation facility. Specialists have provided training to local rehabilitation staff. They have trained local staff to provide care to people with complex injuries including amputations, spinal cord injuries and fractures. The team is providing assistance in the victim's recovery, so that they can raise their families, work, or go back to regular life. Caroline Barmatz, Director of Hydrotherapy at Sheba and her staff, faced '*very challenging*' conditions as the hospital wards filled with young soldiers wounded in Gaza and their families. Caroline describes how young soldiers they are treating were injured by artillery fire, after suffering severe fractures to upper and lower extremities. Other patients suffered amputations and burns. In the neurological wards we are treating wounded soldiers with head injuries and spinal cord injuries. The wounded soldiers were transferred to Emergency Trauma Centres, in the North and the more severely injured were flown by helicopter to Sheba Medical Centre where medical and health professionals provided immediate care for humanitarian emergencies.

METHODS: Rehabilitation specialists, including doctors, nurses, physiotherapists, occupational therapists and hydrotherapists, have been treating the soldiers and civilians over the past months. Three case studies will be presented.

RESULTS: More than 2,100 Palestinians were killed during seven weeks of fighting, some 11,000 injured and 10,000 buildings damaged. Meanwhile, 69 Israelis died, 65 of whom were soldiers. On the last day an Israeli civilian lost both his legs, he too is receiving rehabilitation at Sheba. Neighborhoods in Gaza were completely destroyed, businesses, warehouses and shops were demolished. More than 100,000 people were displaced, according to the UN.

DISCUSSION: Rehabilitation and aftercare are a critical part of the work of the Defence Medical Services. The aim of rehabilitation in the military is to help injured servicemen and women to return to operational duty as soon as possible.

CONCLUSION: Muscle, bone and joint injuries are the most common causes of injury in the armed forces. Servicemen and women with these conditions get a fast diagnosis and, for those who then need it, surgery is undergone in NHS facilities. Most cases need only physiotherapy or rehabilitation treatment. Their rehabilitation is funded by the Ministry of Defence.

POST30

IS ACTIVE RECOVERY IN WATER MORE EFFECTIVE THAN DRY-LAND ACTIVE RECOVERY FOLLOWING A STRENUOUS EXERCISE BOUT?

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INTRODUCTION: An accelerated recovery from strenuous exercise is crucial for sportsmen. Several strategies have been identified in order to increase lactate clearance from the blood and, among others, active recovery in water is gaining popularity. It has been postulated that the hydrostatic pressure would lead to a series of events that ultimately increase lactate clearance. To this day, only 2 papers compared the effect of dry-land vs. water active recovery on blood lactate concentration ([bL]). Both studies revealed a faster lactate clearance in water, but the limitations of their designs as for the intensities of active recovery did not allow an actual comparison. The aim of the present work was to evaluate the actual effect of dry-land and water active recovery on lactate clearance.

METHODS: Seventeen trained cyclists (age 28±6 yr) underwent to the following assessments during 3 experimental sessions: [day 1] incremental exercise test to exhaustion on a cycle ergometer in order to measure maximal oxygen consumption (VO₂) and to identify the lactate threshold (LT); [day 2 and 3] 30s all-out maximal pedalling exercise (resistance: 10% body weight) in order to determine the increase of [bL] until peak (assessed by measuring [bL] each minute until it decreased), followed by 31 min active recovery (intensity: 70% of the VO₂ corresponding to the LT) performed by pedalling either on land (Monark cycle ergometer) or immersed in water (Aquatix water stationary bike) at the height of the armpits. During recovery, oxygen consumption was continuously monitored (COSMED K4b² metabolimeter) and [bL] was measured (ARKRAY lactate meter) immediately before starting pedalling (min 0) and at min 3, 7, 11, 15, 19, 23, 27, 31. The [bL]s measured at each recovery time-point were compared (dry-land vs. water) with dependent sample Student's T-tests with Bonferroni correction (significance level: $p < 0.05$).

RESULTS: The [bL]s did not differ significantly at any time point between dry-land and water active recovery.

DISCUSSION: Compared to the 2 studies found in literature, the opposite results obtained in the present study may be attributable to the following: 1) the intensity of dry-land and water active recovery were closely matched according to the actual VO₂, whereas in the previous studies the intensity was matched by using the heart rate, which has been found to be lower while exercising, at the same workload, in water compared to dry-land; 2) the peak of [bL] was identified and used as starting point of the recovery period in order to take into account the between-subject variability in the time course of lactate accumulation, whereas this variability was not taken into account in both the previous studies; 3) 9 recovery time-points were compared whereas in the previous studies the lactate clearance curves were obtained with fewer [bL] measurements.

CONCLUSION: Active pedalling exercise in water does not seem to be effective in accelerating lactate clearance from the blood. However, further studies are needed to evaluate whether different immersion depth, water temperatures, and exercise modes, may influence the effectiveness of water exercise as a recovery tool.

POST21

AQUATIC PHYSICAL THERAPY FOR LUMBAR DISC

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INTRODUCTION: Study had as main objective to analyze the results of an aquatic therapy program in the treatment of functional disorders resulting from lumbar disc herniation, and specific objectives to identify the influence of the program associated with the immersion in warm water at the level of pain symptoms; compare the level of flexibility pre and post intervention; verify changes in the equilibrium level; identify changes in the level of quality of life and functional performance of these individuals.

METHODS: Was approved by the Ethics of the University of Southern Santa Catarina (CEP / UNISUL) and after signing the Informed Consent and Informed by participants was started physical therapy evaluation and application of the tests, to then intervention in the therapy pool Aquatic Complex, University of Southern Santa Catarina - UNISUL, Pedra Branca. The population consisted of individuals with a clinical diagnosis of lumbar disc herniation confirmed by clinical examination or imaging. The sample was intentional non-probabilistic, consisting of 8 subjects, 5 females and 3 males, with a mean age of 39.7 years. Individuals were selected which have the following inclusion criteria: age between 30-59 years, of both sexes, with no restrictions on intervention in the aquatic environment, agreeing to participate in the program, in agreement with the Terms of Informed Consent; and not participated in the study subjects who had any of these exclusion criteria do another physical therapy concomitant to the study, have associated disease that interferes in the main symptoms, presence of warning signs (tumors, infections, fractures); lack of diagnostic confirmation. From the purpose of the study, the variables were established, divided into dependent (level of pain status, level of flexibility, level of quality of life and equilibrium level) and independent (water temperature). Instruments: Questionnaire disability 'Roland Morris', 'Timed up and go Test', Physical Therapy Assessment Form standardized for patients with spinal injury, Visual Analog Scale pain (VAS), Test Bank Wells, Lasègue Test and Pentacle Welfare (assessment of quality of life). Program took place in the 12-week period totaling 16 meetings, 14 interventions and 2 meetings for completion of the evaluation and re-evaluation. Subjects were randomly divided into two groups in order to customize the treatment. The intervention lasted for 60 minutes and held twice a week in the therapy pool with 34 degrees of temperature. This adaptation was initiated with the aquatic environment, verification of skills, safety and wellbeing of the individual with the environment, as regards buoyancy, ventilation and depth mainly. They were then conducted the exercises and activities as proposed protocol. The same was composed of 4 phases: Phase 1: Heating, Phase 2: Stretching, Phase 3: Exercises for strengthening and stabilization of the lumbar spine, Phase 4: Relaxation.

RESULTS: The diagnostic, clinical and functional complexity that involves the herniated disc and so the disabilities resulting from such disease, are treated by a variety of therapeutic resources that, in turn, show evidence for successful treatment.

CONCLUSION: In this context, the proposed aquatic physical therapy program expressed gains as regards pain, flexibility, functionality and quality of life balance of the participants.

POST22

UNIVERSITY COMMUNITY PROJECT: ACTIVE LIVING

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INTRODUCTION: The project 'LIVE ACTIVE' already serves the community for two years with an aquatic therapy program. The reduction in muscle strength associated with aging may be about 15% per decade after 50 years and approximately 30% per decade after the age of 70. Studies show that healthy individuals 70-80 years have 20-40% lower performance (reaching 50% in the elderly) and muscular strength tests for young people. The objective of this project was to deploy an aquatic therapy program for elderly women with musculoskeletal disorders (especially osteoarthritis), with emphasis on Hydrotherapy, at the University of Southern Santa Catarina - UNISUL, BRAZIL.

METHODS: The extension project took place from 2012 until 2014. extension project included 20 active elderly women. Before the project was carried out an initial assessment made by the application of Map bodily discomfort to assess local and intensity of pain and bodily discomfort; Dynamometry to assess the handgrip; Battery Rikli and Jones tests to assess the physical skills lower limb strength through the test 'chair stand 30 seconds,' strength of upper limbs through the test 'forearm flexion in 30 seconds' and flexibility of the upper and lower limbs through test 'flexibility of the lower limbs and upper limbs.' After initial assessment was drawn up the aquatic therapy program. The exercise had the following objectives: strengthening and muscle strengthening, muscle gain flexibility, range of motion gain and joint physical / aerobic conditioning and relaxation. Every beginning, middle and end of the semester liaison officer were held.

RESULTS: The results of evaluations have demonstrated the effectiveness of the program in reducing pain and bodily discomfort and improving the evaluated physical skills.

POST32

THE 'NEGLECTED FACTOR' IN TEACHING & LEARNING SWIMMING AT SCHOOL: THE TEACHER. EXPERIENCES & REFLECTIONS FROM P.E.- TEACHER EDUCATION IN NORWAY

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INTRODUCTION: Swimming education is an important topic in Norway, a country with a long coast line and lots of lakes. But not just in terms of the lifesaving aspect but also for health care and physical training swimming is regarded as basic ability. The Norwegian government outlines the aim that all school children should have learned in school to swim by the end of the 4th form. The reality is often quite different from that ideal, in 2003 just half of the children in the 5. form were able to swim 200m (NSF/NSSR 2004). Usually schools and Swimming federation blames first of all the bad teaching conditions in terms of lack of access to swimming halls and lack of time. In fact, especially in the bigger cities that seems to be one of the main reasons. But is this the only one? In this paper we will look on the importance of the teaching quality, i.e. who is teaching swimming, and which education those teachers have received and how today's P.E.-students experience and reflect their own swimming education.

METHODS: This qualitative-descriptive study is carried out by using questionnaires, meta-analysis of former studies, qualitative interviews and observations of schools swimming lessons.

RESULTS: In a random inquiry amongst BA - sports students at three universities in Northern Norway the result rather shows that it is not the number of pool lessons which is the problem, but the quality of the teaching process and the teacher's own abilities. When looking at the P. E. - teacher-education one can find a wide range of varieties how the swimming teacher training is organized. While some universities offer a class with duration of 8 hours, there are others with 40 and more lessons and special training in practical teaching. Supplementary teacher trainings for swimming offered in Northern Norway are overbooked and show the need for further education. Also the opinion of what "water competency" or "swimming ability" includes, is characterized by huge differences.

DISCUSSION: The need for a common basis curricula grounded on a shared comprehension of "water competency" is obvious. A successful swimming education is the result of time, facilities AND a good, qualified teacher.

CONCLUSION: It seems to be important to increase the reflection about the teaching swimming process early in the study process for new P.E. teacher students.

POST04

BIOMECHANICS PRE- AND POST- HYDROTHERAPY TREATMENT OF ADULTS WITH CEREBRAL PALSY

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INTRODUCTION: Hydrotherapy has become a popular form of rehabilitation therapy for individuals affected by motor impairments. Several studies have reported the effectiveness of hydrotherapy programs for individuals with cerebral palsy (CP); however, these studies have excluded the adult population. The objective of this research is to investigate the effectiveness of a hydrotherapy program on two ambulatory adult females (GMFCS I) with CP. Biomechanical assessments were performed before and after an aquatic intervention program to evaluate the participant's functional mobility.

METHODS: Hydrotherapy sessions were held twice weekly at a community pool for 45 minutes. Water walking was performed for 30 minutes each session, and leg strengthening exercises for 15 minutes. Pre- and post- therapy, timed-up-and-go, 6 minute walk test, Berg's Balance and GMFM were scored. Motion analysis using a Vicon Corp. infrared camera system was used to collect motion trajectories to calculate spatiotemporal and kinematic gait parameters.

RESULTS: Spatiotemporal measures revealed no differences in one participant between pre- and post- therapy, but for the other, an increase in step length (66 to 74 ± 3 cm) and walking speed (1.34 to 1.54 ± 5 m/s) was observed. For both participants, the timed up and go, the 6 minute walk test and the Berg's balance test showed improvements, while the GMFM was maintained for one, and decreased slightly for the other (decreased ability to balance on affected leg). The kinematics of motion in the sagittal plane resulted in an increase in the range of motion at the ankle on the affected side of one participant, while the other participant increased range of motion at the hip of the affected side and the knee of both affected and unaffected limbs. Finally, the kinetics in the sagittal plane showed a decrease in the peak moment at the ankle of the affected side for both participants, though the hip and knee showed varying results.

DISCUSSION: This study is limited by the presence of only two adult participants. Recruitment during the winter months was found to be difficult and must be taken into account when determining therapy treatment for individuals in New Zealand. Generally, both the physiotherapy results and the spatiotemporal results exhibited an increase in function. The biomechanical analysis however, showed very few consistencies in the sagittal plane between the participants. This suggests that each individual responded to the therapy differently, even though similar exercises were undertaken. When looking at the graphs of motion (rather than the range and peaks), both kinematics and kinetics of the knee appeared to move into a more typical range (as compared to a database of control participants). However, it appears that the hip is compensating for what appears to be better control at the ankle and knee observed by decreased extension and significant increases in extensor moments at heelstrike.

CONCLUSION: Hydrotherapy appears to increase functional abilities for these participants. However, the biomechanics reveal that the two participants have different methods of compensation to achieve this function. Larger studies are required to better assess the effectiveness of hydrotherapy.

POST35

MUSCLE RECRUITMENT IN RUNNING ON LAND AND IN DEEP WATER

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INTRODUCTION; Running is one of the most popular form of exercise people use today to stay in shape and improve their fitness. Runners and joggers can frequently be seen running at different speed in different situations. Treadmills are also popular exercise machines in many gyms, both for general fitness and for specific running training. Further running in deep water has gained popularity in the last few years both as means to return to fitness after injury and as general fitness exercise.

METHODS; A single case study was done where a trained runner ran in four different situations, (treadmill running with 0% incline, treadmill running with 1% incline, deep water running without float belt (DWR) and deep water running with float belt (DWRF)) with the same effort according to Borge scale (12-13). Wireless EMG was used to assess muscle activation in all situations in five muscles: (Gastrocnemius lateralis, tibialis anterior, biceps femoris, rectus femoris, and triceps brachi). Average value of five whole running cycles was calculated and results are depict as percentage value of maximal voluntary contraction described by Seniam. Repeated measures with EMG were taken after one minute of running to estimate muscle fatigue.

RESULTS; There was very little difference between the two running situation on land but comparing the two water situations, there is more muscle activation in DWR than DWRF in triceps brachi but the other way around in biceps femoris and no significant difference can be demonstrated for the other three muscles. Comparing land running with deep water running gastrocnemius demonstrate much higher active on land than in water, but higher muscle activation can be seen in water running for tibialis anterior, biceps femoris and triceps brachi, but no significant difference was found in rectus femoris. Only tibialis anterior showed any real fatigue after one minute of running in water.

DISCUSSION; From this case study we have demonstrated that it is possible to use EMG to measure and compare muscle activity both on land and in water. The fact that no difference was found in the two land situations demonstrats that 1% incline which many runners use on the treadmill does not significantly alter the muscle activation in these five muscles. Gastrocnemius showed significantly less activation in water than on land which can be explained with less weight bearing in water. Tibalis anterior, biceps femoris and triceps brachi needs to push against the water with large surface of the leg either in flexion or extension creating large drag, which can explain higher activation of these muscles in water while biceps brachi pushes against the water with bent knee and there for not creating as much drag. The only muscle to show any real fatigue in the EMG data was Tibialis anterior when running in water. This can be explained with tibialis anterior needs to hold the ankle in fixed position against viscosity of the water when the knee is extending and although the subject was highly trained in running on land and skilled deep water runner, her tibialis anterior is not so well trained muscle in her case.

CONCLUSION; Even though many things are similar between running on land and in water it is not possible to conclude from this study that running in water can be seen as specific training for running on land

POST12

INFANT AQUATICS UNIQUE APPROACH FOR YOUNG INFANTS BORN PREMATURE

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INTRODUCTION: Preterm infants, a continuously growing population, are at risk for neurodevelopment impairments and brain injury ranging from Minor Neurological Deficits to Cerebral Palsy. Early intervention is crucial, especially during peak expression of Cortical Sub Plate, as it may minimize neurologic and functional deficits. The chemical, thermal and mechanical properties of water have been long employed therapeutically to improve circulation, muscle tone, range of motion and coordination. Moreover, water provides a unique sensory environment - the infant is surrounded by increased sensory input, and the high resistance and buoyancy provide a soothing relieve of pain and stress and allow increased reaction time. These can be used to facilitate appropriate or desired reactions without the use additional manipulations. The efficiency of infant aquatics depends on our understanding of and focuses on the young infant's special characteristics. The objective of this research is to examine the influence of our hydrotherapy model for young infants born premature, as reflected in their reactions and behavior in water during exercise along intervention period.

METHODS: Our study with young premature infants employs a unique model developed by us and adjusted for the infants' special characteristics. The model is based on our knowledge in worldwide known hydrotherapy approaches. In the first meetings we combine passive mobilization, deep massage and muscle stretch and relaxation. Exercise regime includes horizontal transitions between gentle graded spinal flexion and rotatory shoulder and pelvic movements while the infant is passive and fully supported by the therapist or parent. Thus, the infant's graceful movements through the water promote a deep state of relaxation with beneficial changes in the autonomic nervous system, decreased heart rate, deeper respiration, and increased peripheral vasodilation. In the following set of meetings our work integrates also play with stimuli. Approximately 80% of infants have in-water parent participation, contributing to special infant-parent bonding and emotional support.

RESULTS: During sessions and developmental tracking period there has been no report of infant illness associated to training in water. Immediate beneficial results from first session on include eliciting of an infant 'quiet alert' state in the water, decreased muscle tone and spasticity which stay for hours after water session, reduction in anxiety and stress levels, improved sleep and digestion (the infants usually eat well and go to sleep peacefully right after water session), and general comfort due to decreased alert and activity of Reticular Activating System.

DISCUSSION: Changes in infants' reactions during intervention sessions will be presented in video recordings.

CONCLUSION: We conclude that Infant Aquatics adjusted for young infants born premature, can be safely applied to young infants born premature and can be regarded as a suitable aquatic rehabilitation approach.

POST26

OUTCOMES OF AQUATIC THERAPY PROGRAM FOR A STROKE CAPSULAR-THALAMIC IN RIGHT HEMISPHERE -CASE STUDY

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INTRODUCTION: The advantages of aquatic therapy (AT) in a case with poor prognosis, due to the sensorial perturbation related with the neglect syndrome. The aim of the study is to describe *the recovery and the outcomes* for a male adult with disabilities because of a stroke using a specific and individualized AT program.

METHODS: The study was conducted in two swimming pools of Ovar city with individual hydrotherapy programs.

A male adult with haemorrhagic stroke, 63 years old, severe risk factors of repetition and bad prognosis because of damage in the main structures like thalamic and vestibular nucleus with the neural misalignments and a severely affected motor control. The patient had a “Pushing syndrome” on the right side. *The case* study was supported by literature and clinical reasoning of a trained professional. ICF, Berg and FIM were used as outcomes.

RESULTS: The ICF, Berg and FIM of the participant show the value and effectivity of the AT program. Through AT, the patient’s acquisition was based in motor learning strategies, dynamic systems, Gentile’s taxonomy tasks. The functional activity increase and improve in ADL more than the expected prognosis. Prior to AT he had 24 months of rehabilitation with an unchanging profile. He was total dependent of carers in all ADL, depressed, without expectancy in recovery. Now, after 3 years of AT the participant has alignment, is able to walk with tripod adjustable stick.

DISCUSSION: Through photos and videos we can show how developed the treatment strategy to achieved the big aim of the patient/family - independent walking.

CONCLUSION: This case study shows how quantitative assessment can validate an AT intervention and enforce the role in rehabilitation in this kind of pathology.

POST14

THE EFFECTS OF COMBINED SPA -EXERCISE THERAPY ON BALANCE AND PERIPHERAL MUSCLE STRENGTH RELATED SYMPTOMS IN PATIENTS WITH SPONDYLOARTHROPATHY

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INTRODUCTION: There is limited evidence on effects of combined spa -exercise therapy in patients with spondyloarthropathy. Most studies with this population focus on pain, morning stiffness and spinal mobility. Posture deterioration is one of the most important symptom which causes and effected by muscle peripheral muscle weakness and balance problems. Therefore the purpose of the study was to evaluate the effects of combined spa -exercise therapy on balance and peripheral muscle strength related symptoms in patients with spondyloarthropathy.

METHODS: Eighteen subjects with the mean age of 50,00 years (+5,34) diagnosed spondyloarthropathy were allocated to combined spa therapy consisting land group therapy, pool group therapy, individual land therapy and superficial heat and electrotherapy if necessary. Each session were 30 mins five times in a week and lasted for 4 weeks. Exercises in both land and pool group treatments were on spinal mobility, gross muscle strengthening, stretching and relaxation. Temperature of the exercise pool was between 36-38 °C and the depth was between 130-140cm. Subjects were assessed before and after treatment. Functional reach test was used for balance, sit-to-stand and hand grip dynamometer. Pain, morning stiffness and fatigue were also evaluated by 10 cm visual analogue scale.

RESULTS: A significant increase in both balance and peripheral muscle strength was found after 4 weeks combined spa- exercise therapy. Mean lateral flexion was increased for right from 31,77 + 10,80 cm to 36,47+ 10,57cm ($p<0.001$); for left from 30,50 +12,93cm to 37,22+13,33cm ($p<0.001$).; for forward from 34,44 + 6,89 cm to 37,88 + 6,67cm ($p<0.001$). Similarly peripheral muscle strength was changed from 26, 66 + 12,12 kg to 39,16 + 12,68 kg ($p<0.001$) according to hand grip measurement. Lower extremity muscle strength was assessed with sit to stand test in which the number of repetitions increased from 23,27 + 5,15 to 29,83 + 4,76.

DISCUSSION: Combined spa exercise therapy was reported as beneficial for patients with spondyloarthropathy in terms of pain, morning stiffness and spinal mobility. Patients with spondyloarthropathy predominantly suffer from posture problems which may affect balance and peripheral muscle strength.

CONCLUSION: This study provides some evidence that combined spa exercise therapy improves balance and peripheral muscle strength in patients with spondyloarthropathy.

POST36

CLINICAL FORCE PRODUCTION OF SOME WIDELY USED AQUATIC EQUIPMENTS

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INTRODUCTION: Water exercises are safely used for both therapeutic and fitness purposes. It was well defined that water is unique environment for cardiovascular and muscle strengthening. Resistance is one of the most important parameters of strengthening exercises. Different equipment is widely used in water exercise to create resistance without knowing the force production with immersion and/or drag force. The aim of this study was to quantify the resistance offered by aquatic equipment (pool noodle, Nabaiji® pullpush blue, and Nabaiji® kickboard) widely used for strengthening exercises.

METHODS: Calculations were conducted in a swimming pool with 1.20 m depth and 33⁰C temperature of tap water. A regular pool noodle was fully immersed into water in four conditions; (a) full length (116 x 3,2²x p cm³), (b) half length (58x 3,2²x p cm³), (c) quarter length (29 x 3,2²x p cm³) and (d) full length knotted. Kickboard 43x27x3 cm³ (Nabaiji®) was fully immersed. Finally for the water resistance device Nabaji ® pullpush blue (p18²cm²) was drag under the water 1m/sec. A water proof steelyard attached to the middle of the devices to pull downward/drag which measures the amount of force in kilograms needed to immerse/drag the equipment.

RESULTS: Full length, half-length, quarter- length pool and full length knotted noodle were needed 4 kg, 2kg, 0, 75 kg and 3,75kg respectively. To fully immerse the kickboard (Nabaiji®) 3kg was calculated. The force calculated for the water resistance device Nabaji® pullpush blue (p18²cm²) as 2,5kg. The amount of forces did not change in different depth of immersion.

DISCUSSION: Strengthening exercises are important aspect of therapeutic and fitness training to which water provides several health benefits. Pool noodles, kick boards and drag resistive devices are commonly use for the resistance in aquatic strengthening exercises. It is very important to know the load of the movement to adjust the intensity of the exercise.

CONCLUSION: This study provides some information about the clinical force production of some widely used aquatic equipment.

POST34

THE PATIENTS' CHOICE AND ATTITUDE TOWARDS AQUA THERAPY, LAND THERAPY AND HANDS-ON LAND THERAPY IN PATIENTS WITH RHEUMATOLOGIC DISEASE

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INTRODUCTION: The patients' choice on the treatment that they receive was reported as an important aspect for the attendance and dedication to the treatment and behavioural modification. Even though aquatic therapy is assumed to be fun, enjoyable and effective treatment method very little is known about the patients' choice and attitude towards different treatment modalities.

METHODS: A simple 11 questioned self-administered questionnaire was formed to understand patient's profile and choice and attitude towards different treatment methods. First 4 questions were about gender, age, diagnosis and span of illness. In next 5 questions patients asked to indicate their pain severity, morning stiffness, perceived importance of each, hands-on (individualized) land therapy, land group therapy and aquatic group therapy in 10 cm visual analogue scale. Last 2 questions patients had to pick appropriate option (individualized exercise, land group exercise, aquatic group exercise) multiple choice questions were they were asked "which one did you enjoy most" and "which one would you pick if you had only one treatment method options".

The questionnaire was handed out at the last treatment day of combined spa and exercise therapy lasted for 4 weeks. Each patient was received 30 min of hands-on land therapy (IndT), land group therapy (LGT) and aquatic group therapy (AGT) from different physiotherapists. Exercises in both land and pool group treatments were on spinal mobility, gross muscle strengthening, stretching and relaxation. Temperature of the exercise pool was between 36-38 °C and the depth was between 130-140cm.

RESULTS: Forty-six subjects (female n=29, male n=17) with the mean age of 52,63 years (+7,88) diagnosed rheumatologic disease with the mean span 18,04 (+10,61) years. 47,8% of the patients were diagnosed with rheumatoid arthritis (n=22) and 52,2 % were spondyloarthritis (n=24). The mean pain and morning stiffness levels were reported 2,23 +1,92 and 2,01+2,05 respectively.

Patients stated that the importance of all three methods were almost same (IndT= 8,92+ 1,4; LGT= 8,53+ 1,6; 8,56+ 1,61), yet 52,2% (n=24) said hands-on therapy was the most enjoyable where 28,3% (n=13) for LGT and 19,6 (n=9) for AGT. More than half of the patients (%60,9; n= 28) said they would choose hands on therapy if they had only one treatment option and the percentage was same for LGT and AGT (%19,6; n=9).

DISCUSSION: Patients with rheumatologic diseases get reasonably benefit from combined spa and exercise therapy. Even though patients report that aqua therapy is important for them it does not necessarily mean that they would choose aqua therapy for the only treatment modality. Patients preferred tailored exercise program rather than a group exercise.

CONCLUSION: It is logical to say that aqua therapy is beneficial for people with joint pain and stiffness however to make aqua therapy as a patient choice individual aquatic exercises should be offered and used as a treatment method.

POST24

PILOT STUDY: CAN SWIMMING BACKSTROKE HAVE A POSITIVE EFFECT ON NON-SPECIFIC LOW BACK PAIN?

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INTRODUCTION: D. Mergeay and M. De Naeve did a theoretical study where they searched for advantages of hydrotherapy, method backstroke swimming, for clients with lumbar hypermobility. They predicted in ten points why swimming of the backstroke would be effective for clients with lumbar hypermobility. This hypothesis was starting point for research by Psychomotricity students at the Windesheim University. In October 2014 they started a swim program for people with chronic non-specific low back pain, containing body scan, core stability exercise and swimming backstroke. The clients are given a 45 minutes group program and 30 minutes of independent backstroke swimming during the week for nine weeks. This pilot study investigates the effectiveness of a backstroke swimming program on quality of life and low back pain. If results within the pilot group are positive this study will be duplicated on bigger scale with control group.

METHODS: 9 adults with chronic non-specific low back pain who swim twice a week participated in the study.

The participants are going to be measured at T0, T1 and T2 on quality of life using the RAND 36, and the perception of the low back pain using VAS scale and Quebec Back Pain Disability Scale.

RESULTS: This study is work in progress. Results will be available in February 2015.

DISCUSSION: One of the issues to discuss will be if a horizontal intervention (back stroke swimming) can have a positive effect on non-specific low back pain in vertical postures.

POST13

EFFECTIVENESS OF AQUATIC PHYSICAL THERAPY MECHANICAL BACK PAIN - HIAE PROTOCOL

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INTRODUCTION: Low back pain is a major cause of pain that affects the quality of life and occupational activity of the population. Physiotherapy is in search of techniques that can intervene in an increasingly efficient way to solve the causal problem. In this context, aquatic physical therapy techniques have been applied and it brings benefits in regard to the pain symptoms and functionality of these patients.

METHODS: This is a survey of case series of patients undergoing a program of aquatic physical therapy at Albert Einstein Hospital in the period from June 2013 to June 2014 were selected 89 individuals with low back pain aged 18-60 years, of both genders. The evaluation consisted of history, physical examination and specific questionnaire. After this step, the volunteers underwent 10 sessions of aquatic therapy. All subjects were assessed at the 1st and last session. Participants underwent an initial assessment, a second assessment after 10 sessions and if the treatment is continued, an evaluation after treatment. Pain and quality of life were measured by the Roland Morris and EQ-5D questionnaire.



RESULTS: The results showed a significant improvement of the pain symptoms, 64.04% ($p < 0.05$), 4.49% remain unchanged, 12.36% ($p < 0.05$) showed a partial improvement and 19.10% quit treatment. Regarding quality of life, there was substantial enhancement in 62.00%, 5.06% remain unaltered and 13.84% ($p < 0.05$) had partial improvement, all results were evaluated using the Mann-Whitney test (level of probability 88.77%).

DISCUSSION: The aim of this study was to present a specific water-treatment technique to confirm the positive results in pain and quality of life that were shown before in literature. Furthermore, there was evidence of the applicability of questionnaires to monitor and confirm, effectively, these results.

CONCLUSION: There was a significant improvement in pain symptoms and quality of life of patients undergoing a treatment protocol showing the effectiveness of aquatic physical therapy mechanical back pain, as well as, the evidence of the applicability of evaluation methods using the Roland Morris questionnaire and the EQ5D.

POST03

IMPROVEMENT OF GROSS MOTOR FUNCTION AND SWIMMING SKILLS BY USING AQUATIC EXERCISE IN CHILDREN WITH CEREBRAL PALSY

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INTRODUCTION: In order for children with cerebral palsy (CP) to perform everyday activities more independently, one of the requirements is to increase their levels of physical activity and fitness. Various exercise programs can be applied to this end, both on land and in water. Systematic reviews to date have demonstrated that a number of outcomes can be influenced in children with CP. The purpose of this paper is to determine the effects of aquatic exercise on gross motor function and swimming skills in children with CP.

METHODS: This study included two initial and one final measurement. Time between the two initial measurements was 12 weeks, a control period aimed at determining whether the outcomes studied would change spontaneously without the influence of the exercise program. The research sample comprised 15 children with CP whose mean age was 12.3±3 years, and Gross Motor Function Classification Scale level I-III. To estimate gross motor function, the 88-item Gross Motor Function Measurement (GMFM) was used. To assess swimming abilities, the Water Orientation Test Alyn 2 (WOTA2) was used. The program took place over 12 weeks with a frequency of 3 times per week. During the first 30 minutes of each session, the Halliwick program and exercises for teaching crawl, backstroke and breaststroke techniques were used. During the latter 30 minutes, aquatic walking exercises with different tasks were used, alongside exercises for increasing leg muscle strength. To test the normality of distribution, the Kolmogorov-Smirnov test was used. To determine inter-measurement differences, the dependent-samples t-test was used.

RESULTS and DISCUSSION: Between A1 and A2 initial measurements, no outcomes showed statistically significant changes, suggesting, similarly to previous studies, the control period was stable. Between second initial and final measurements, i.e., after applying the exercise program, statistically significant improvement occurred in D and E dimensions, as well as in the overall GMFM results at significance level ($p = 0.00$). Unlike dry-land activity, water enables children with CP to perform greater-amplitude movements with more repetitions but decreased fatigue, a contributing factor to improvements along dimensions D, E and overall GMFM result, and positive transfer from aquatic to dry-land movement abilities in this participant group. Regarding swimming skills, improvement occurred in overall WOTA2 results and in subdimensions of mental adjustment (MA) and skills, balance and movement (SBM), with a significance level ($p = 0.00$). Success in mastering elements of swimming techniques, as evidenced through WOTA2 results, enables children with CP to learn to swim relatively quickly, and use swimming to enhance their physical fitness levels, and, indirectly, life quality.

CONCLUSION: The applied aquatic exercise program is efficient in terms of enhancing gross motor function and swimming skills, and can therefore be recommended as a form of exercise and therapy for children with CP GMFCS levels I, II and II, in pool-equipped sports facilities.

POST28

BIOMECHANICAL PROFILE OF A UNILATERAL HAND AMPUTEE SWIMMER

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INTRODUCTION: Swimming performance is directly related to a set of biomechanical factors and motor strategies. In swimmers with a physical impairment only few studies have been made of the impairment performance relationship needed to help coaches and direct athletes classification. The purpose of the present study was to use an existing biomechanical profile analysis for able bodies swimmers to a Paralympic unilateral arm amputee swimmer.

METHODS: A 25 years-old Paralympic male swimmer (1.91m and 79kg) with left hand amputation (classified as S9) was tested for stroke length (SL, horizontal displacement covered during one upper limb cycle), stroke frequency (SF, inverse of the time to complete one upper limb cycle), intracyclic velocity variation (IVV, coefficient of variation of the instantaneous velocity-time data), propelling efficiency (η_p , calculated from the underwater phase only, Zamparo et al., 2005) and index of coordination (IdCadapt lag time between propulsive phases) performing an intermittent incremental test protocol of 7 x 200m front crawl (0.05m.s⁻¹ increments and 30s intervals) until exhaustion (Fernandes et al., 2006). The protocol was videotaped (4 underwater and 2 surface cameras) and the 125m of each step were selected for 3D reconstruction.

RESULTS: With velocity increments, SF (0.59 to 0.79Hz) and IVV increased (0.15 to 0.20) and SL (2.00 to 1.61m) and η_p decreased (34.3 to 29.2). The IdCadapt values remained constant along the incremental test (-22.1 to -22.7).

DISCUSSION: The stroking parameters behaviour is in agreement with literature (Osborough et al., 2010), evidencing that amputee swimmers reach higher velocities by increasing SR and decreasing SL. Nevertheless, The IVV values were higher than those reported previously for able-bodied swimmers (Vilas-Boas et al., 2010) and it was not constant along the protocol. Moreover, IdCadapt increased with a concomitant η_p decreased, suggesting that amputee swimmers are not able to adapt their coordination to maintain technical efficiency and propulsion continuity, contrarily to the observed for able-bodied swimmers (Schnitzler et al. 2010).

CONCLUSION: These outcomes are useful to develop specific training and enhance swimming performance in amputee swimmers.

Acknowledgement

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POST19

DAY TO DAY IMPROVEMENT AND INTERTRIAL VARIABILITY OF BALANCE PARAMETERS IN ELDERLY PATIENTS SUBMITTED TO AN AQUATIC MOTOR CONTROL INTERVENTION AFTER HIP REPLACEMENT

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INTRODUCTION: Hip replacement has found to assist patients to attain almost normal control of balance in tasks accounted in daily life activities (Majewski et al., 2005). Rehabilitation programs after hip replacement aim to improve balance and to reduce weight bearing asymmetry (Talis et al., 2008). The purpose of the present study was to evaluate the day-to-day improvement and the inter-trial variability of balance parameters in elderly undergone a hip surgery after the application of aquatic therapy.

METHODS: Participants: Seven (6 females, 1 male) patients (mean age 72.6 ± 10.1 yrs), after hip replacement, were examined. Procedure: Participants were tested in quiet stance balance tests before (initial measurement) and after an aquatic therapy session. Intervention: Patients underwent the aquatic motor control rehabilitation program 15 days after surgery. The intervention consisted of six 70-minute aquatic therapy sessions conducted in six consecutive days. A 20-minute segment based on Clinical Ai Chi was implemented in each therapy. Instrumentation: The balance tests (duration = 10 sec) were executed on Zebris FDM-T System (Zebris Medical GmbH, Germany). Sampling frequency was set to 100 Hz. Statistical analysis: The data of the balance parameters within each day testing were averaged and are presented as M (mean) \pm SD (standard deviation). The intra-day coefficient of variability (CoV) was also calculated. Day-to-day modifications were examined using repeated measures ANOVA. All statistical tests were executed using SPSS 10.0.1 (SPSS, Chicago, IL).

RESULTS: After the completion of the 6-day aquatic therapy intervention, a 12.9%, 14.3%, and 20.5% improvement for the medio-lateral, anterior-posterior and vertical ground reaction force stability was observed. On the opposite, load distribution was progressively tending to be more symmetrical up to the fourth day (from 63.2% loading on the healthy lower limb to 61.5%), but returned to the initial values onwards. Statistical analysis revealed that no significant differences existed among the tests ($p > 0.05$). Results for the CoV revealed that, despite the lower values for stability, the examined patients executed the tests with less variability for the medio-lateral stability on the initial test compared to the post-intervention test ($p < 0.05$). The CoV of the anterior-posterior stability, the vertical ground reaction force stability and the loading on the healthy and the operated leg were lower after the completion of the aquatic therapy intervention. It is worth mentioning that the lower CoV for the anterior-posterior stability was noted after the third aquatic therapy session. Pair-wise comparisons revealed that the anterior-posterior stability was significantly changed ($p < 0.05$) among the third, fourth and fifth aquatic therapy session.

DISCUSSION: Results indicated that aquatic therapy improved quiet stance balance parameters. The reversal of the rate of improvement after the fourth session could be attributed to possible learning effects or fatigue. Nevertheless, the small number of participants and the lack of a longer in duration intervention urges for further investigation on the topic.

CONCLUSION: Quiet stance balance parameters can be improved after a series of four aquatic therapy sessions in elderly patients after hip replacement.

POST07

THE BENEFITS OF AQUATIC THERAPY IN A CASE OF DUPLICATION OF CHROMOSOME 17p13.3

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INTRODUCTION: the chromosome 17p 13.3 is the part of a gene that when deleted is associated with Miller-Dieker syndrome. The duplication of this part has been recently discussed in the past studies. Patients with this chromosomal abnormality have phenotypic alterations such as growth abnormalities, dysmorphic facial features, mental retardation, neurological problems and other medical conditions. A wide variety of developmental and health abnormalities occur when chromosome 17p 13.3 has been duplicated. Motor development is one of these aforementioned alterations. Aquatic Therapy by the Halliwick Concept addresses the shortcomings of the functions and structures of the body to increase patient participation. Below we are going to see a case of 17p 13.3 chromosomal duplication which has been treated by Halliwick Concept, the objective being increased musculoskeletal development and acquisition of motor skills.^{1,2}

METHODS: a 2 year old child was diagnosed with duplication of chromosome 17p13.3. He has moderate hypotonia 35° in the sitting pelvic tilt and lack of full extension of both knees (popliteal angle) right -15° and left-20. He shows a delay in the acquisition of gross motor skills (motor responses six months, three months static and locomotion by Peabody Development Motor Scale). He started physiotherapy sessions at 10 months old and Aquatic Therapy at 19 months. This consisted of fifteen sessions 30 minutes on a weekly basis. The Halliwick Concept is applied (Ten Points Program and / or Water Therapy Specifies) to achieve sagittal and transverse control rotation to improve the extension of the trunk and lower limbs for propulsion acquisition of bipedalism. An automated Fisih2o satisfaction questionnaire is given to the parents for their feedback.



Figure 1: Trunk extension

RESULTS: the boy has been able to extend the extensor muscles of the trunk with 25° in the sitting pelvic tilt. Regarding the lower limbs we have seen a 5° improvement in both limbs. The acquisition of bipedalism is achieved with less help from by therapist (from the knee) and he can withstand it for between 10-15 minutes, buy only when in the water. The Peabody Development Motor Scale remains unchanged. According to the parents´survey this therapy was found to be the most motivating for the patient.

DISCUSSION: no evidence has been found about the benefits obtained in chromosomal pathologies treated with aquatic therapy. In our experience, the Halliwick Concept allows us to make large rotational movements in a smooth and continuous manner facilitated by the properties of the medium that has helped normalize the tone. Its allows us to promote early mobility to motivate children, facilitating their subsequent performance and participation. All of l this is highly valued by the parents.

CONCLUSION: the Aquatic Therapy through the Halliwick Concept appears to facilitate musculoskeletal development and motor skill acquisition in children with the duplication of chromosome 17p 13.3. It is necessary and it is suggested that we continue doing more solid research and find scientific evidence for chromosomal pathologies that demonstrate and corroborate with statistically significant and conclusive data of the Halliwick Concept.

POST23

ACUTE EFFECTS OF MANUAL THERAPY IN DRY AND AQUATIC ENVIRONMENT ON THE LOCAL TEMPERATURE AND PAIN IN PATIENTS WITH MYOFASCIAL PAIN SYNDROME

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INTRODUCTION: Myofascial pain syndrome (MPS) is a commonly found among patients with musculoskeletal pain (Fleckstein, Yeng, Yap). The goals of physical therapy treatment for this syndrome are to restore function and relieve pain. Among the various techniques of manual therapy used to treat MPS, transverse friction massage is a traditional option (Cyriax and Cyriax). Moreover, various forms of hydrotherapy have been shown to be effective in reducing pain (Geytenbeek). Nevertheless, despite the manual therapy is widely used in aquatic therapy programs, there is little scientific evidence on the comparison of effects of manual therapy performed inside and outside of aquatic environment. The general objective of this research was to study and compare the immediate effects of massage with the use of spikeball on the pain and local temperature in patients with SDM in dry environment and immersed in warm water.

METHODS: 39 individuals of both sexes with myofascial pain, presenting trigger points or tender areas in the scapular girdle participated in this study (previously approved by the Ethics Committee of a local University). Pain scores of each individual through the McGill Pain Questionnaire (MPQ) and Visual Analog Scale for pain (VAS) were obtained. Then, the subjects were evaluated with a dolorimeter and thermographic data were obtained. The individuals were divided into two groups (dry and aquatic environment). The intervention consisted of transverse frictional massage using a Spikeball, applied bilaterally for 20 minutes, within the environment randomly selected. The manual pressure was adapted to the threshold of individual comfort.

After the experimental intervention, individuals were immediately sent to thermographic reassessment. Then, subjects were evaluated again with the algometer and filled another VAS and MPQ. Statistical Analysis was made using SPSS Statistic 17.0 and Gpower 3.1. The significance was determined at $p \leq 0,05$. Normality of data was verified by a Kolmogorov-Smirnov (K-S) test and different Analysis of Variance (ANOVA) were made using mixed models (whithin-between), and post-hoc test of Bonferoni was used.

RESULTS: There were no differences among groups in any variable studied before intervention. In both groups we found an increase in the average measured value algometry (dry $p=0,005$; water $p=0,026$) and a reduction of VAS values (dry $p=0,019$; water $p<0,001$) and reduction in McGill Index (dry $p=0,009$; water $p<0,001$) between the data before and after intervention, characterizing a reduction in pain. There was an increase in temperature in dry group ($p<0,001$) but not in water group ($p=0,64$). After intervention, the “dry” group showed higher values in thermographic data ($p=0,004$) and pain threshold than “water” group ($p=0,014$), while the “water” group showed lower values in VAS than “dry” group ($p=0,046$).

Correlation between all systems of pain evaluation was significant at the 95% level and the VAS-MPQ correlation was the highest (coefficient 0,618), indicating strong concordance between data.

CONCLUSION: Frictional massage presents positive acute effect in pain management of patients with MPS, whether applied in water or dry environment. In this study, different assessment instruments of pain have yielded controversial results. Further studies in this field are required.

POST06

COMPARISON OF PASSIVE RANGE OF MOTION OF THE UPPER AND LOWER EXTREMITIES AFTER A SESSION OF CLASSIC HYDROTHERAPY VS. HALLIWICK IN CHILDREN WITH CEREBRAL PALSY: RANDOMIZED CLINICAL TRIAL

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INTRODUCTION: Aquatic therapy for non-ambulant children with cerebral palsy (CP) is generally based on the Halliwick concept in which the child is supported around the lower extremities in order to facilitate function of trunk, head and upper extremities. Alternatively the classical methods use flotation aids to limit function of trunk, head and upper extremities but allow the legs to move freely. We compared both approaches to assess the effects on range of motion (ROM).

METHODS: 15 Children with spastic CP, GMFCS II-V, aged 4-14 were included and randomly assigned to either Halliwick or classical method sessions. The pool (34°C +/- 2°) sessions took 20 to 30 minutes. ROM was measured with goniometry. The measures were taken at the most pathological side before the session (1): shoulder flexion, elbow and wrist flexion/extension (supine); hip flexion, knee and ankle flexion/extension (supine); hip extension (in prone), immediately after the session and again after +/- 30 minutes.

Results « classic »			
Joints	Movements	Tests of inter-subject effects	Comparison 3 measures
shoulder	Flexion	NS	NS
	Extension	-	-
elbow	Flexion	NS	1-2 S
	Extension	NS	NS
wrist	Dorsal flexion	S	1-2 S + 1-3 S
	Palmar flexion	NS	NS
hip	Flexion	S	1-2 S
	Extension	THS	1-2 HS + 1-3 HS
knee	Flexion	S	2-3 S
	Extension	HS	1-3 S
ankle	Dorsal flexion	HS	1-3 S
	Plantar flexion	NS	NS

Results « Halliwick »

EXTENSION	TIME 1-->2	ELBOUW	HS
		HIP	S
	TIME 1-2-3	ANKEL	S
FLEXION	TIME 1-->2	WRIST	HS
		HIP	S
		KNEE	S
	TIME 1-2-3	SCHOULDER	S
		ELBOUW	S

DISCUSSION: The classical method showed an increase of the range of motion of hip flexion, hip extension, dorsal flexion of the wrist and the ankle. Knee extension increased. Halliwick showed more effects in the Upper extremities (UE) than in the Lower extremities (LE) and more in the proximal joints with small variations over the measurements. The comparison of the two methods shows that Halliwick increases range of motion mainly in proximal joints of the UE, whereas the classic method shows a larger increase of range of motion in the distal joints of the LE (probably with more degrees of freedom). Halliwick tends to be more specific and more localized, in accordance with its effects on spasticity (Meyer et al, 2013). The classic method shows a more global effect for range of motion not using as much rotatory movements and therefore limits the advantage of using proximal joints when exercising range of motion: distal movement increases. The rotary movements in Halliwick decreases tonus in proximal joints and consequently distal joints do not need to compensate proximal stiffness, probably because of handhold control.

POST09

INFLUENCE OF COLD OR WARM WATER IMMERSION ON MUSCULAR DISPLACEMENT AND MUSCLE CONTRACTION TIME

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INTRODUCTION: the use of hydrotherapy as a measure of post-stress recovery is generalized in the field of physiotherapy and sports medicine. The great variability in its application^(1,2) has recently led in a growing interest in learning the individual's physiological response to some biophysiological parameters⁽³⁾. However, few studies have analyzed the influence of the hydrotherapy in the contractile properties of muscle using the Tensiomyography (TMG), a relatively recent technique based on the quantification of the radial muscle belly displacement in response to a single electrical stimulus^(4,5). The purpose was to compare the evolution of muscular displacement (Dm) and muscle contraction time (Tc), measured by TMG, in cold and warm immersion protocols and its evolution over time and up to 40 min later.

METHODS: Twelve healthy and physically active subjects volunteered to participate in the study. It was analyzed Dm and Tc of the femoral biceps before and immediately after 20 min in both cold and warm water immersion (CWI or WWI) and in the 10, 20, 30 and 40 min later. Their characteristics were as follow (mean \pm SD): age 23 ± 3 years; body height 1.81 ± 0.08 m; body weight 74.79 ± 8.10 kg; body mass index 22.87 ± 1.35 ; minimum perimeter means of lower limbs $51, 69 \pm 2.95$ cm and maximum perimeter means of lower limbs 56.21 ± 2.76 cm.

RESULTS: It was observed a significant decrease in Dm values of 0.05 %, 18.05 % i 13.05 % in the post immediately, 10 and 20 min after immersion respectively, and a significant increase of 0.17 % and 10.11 % at 30 and 40 min post-immersion in CWI. A greater Dm enhances a radial strain muscle that is characteristic of hypotonic or relaxed muscles.

It was observed a significant increase in Tc of 13.6 %, 12.08 %, 4.23 %, 18.13 % and 22.36 % in the post immediately, 10, 20, 30, and 40 min post-immersion in CWI. A greater Tc relates to a muscle slower because it requires more time to get the 90% of the maximum contraction. However it was observed a lower after WWI.

DISCUSSION: Our results are consistent which with other studies that founded decrease muscle tone after a long application of cold or warm water. The Tc founding could be taken account especially in sports with high demands of velocity^(6,8) and to avoid potential risks from the transitory effects of a more stiffness muscle and/or slow.

CONCLUSION: this study shows that water temperature affects the behavior of muscle contractile properties after an exposure of 20 min. Dm increases over time, being more evident with cold water. Tc is higher in the immediate post after CWI as well as 10 min after the exposure to WWI.

POST 38

MOTIVATION AND ADHERENCE FOR HYDROTHERAPY IN USERS WITH CHRONIC PAIN - A SYSTEMATIC REVIEW OF LITERATURE

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INTRODUCTION: Chronic Pain is a leading cause of disability. Hydrotherapy (HT) is one of the therapeutic interventions most sought for chronic pain relief. Although the existing evidence suggests this effectiveness of HT and the beneficial effects of exercise we continue to see a poor adherence and maintenance to exercise. The aim of this systematic review (SR) was to analyze the literature on: a) the effects of HT interventions for community-dwelling adults and older people with chronic pain, first phase; and b) the motivation and/or adherence for HT or aquatic exercise (AE), second phase.

METHODS: MEDLINE, CINAHL, Pub-Med, PEDro and PsycINFO were searched between June 2006 and February 2013. Additional studies were identified by contacting clinical experts and by manual search. Search terms included only randomized controlled trial (RCTs), that included at least one treatment group that received HT or AE, in adults or older people, with chronic pain as an outcome measure. In a stage 2 process, using the same data sources, over the period of 2003 to February 2013, we investigate papers studying the motivation and/or adherence for HT or AE using diverse quantitative methodological approaches.

RESULTS: Nine studies met the inclusion criteria of the first phase. The average methodological quality for all 9 RCTs studies was 6.0 using the Physiotherapy Evidence Database Scale (PEDro). We found evidence that HT or AE had statistically significant effects on chronic pain relief when compared with no treatment. In the stage 2 we found 5 studies, including 1 RCTs and 4 cohort studies. All studies were 2b using the “Levels of Evidence” of the Centre for Evidence Based Medicine (CEBM) (2009). We found evidence that exercise, high intrinsic motivation to exercise and motivational interviewing (MI) are effective in pain relieve, improving physical mobility, psychological well-being and self-efficacy, promoting more autonomous motivation.

POST16

ADVANTAGES OF THERAPEUTIC BATH IN SULPHUROUS WATER OF POSTTRAUMATIC PATIENTS IN SPA RESORT PUCIOASA-ROMANIA

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INTRODUCTION: Pucioasa Spa Resort is located in the Carpathian area of Wallachia, a region of moderate and sparing sedative climate. Sulphurous water springs were analyzed for the first time between 1821-1827, the first public baths pavilion was built in 1834. Natural specific therapeutic factors are represented by: (1) Mineral sulphate, sulphurous, calcium, sodium, hypotonic waters, with mineralization between 3.9 to 16.8 g / l. The water temperature at 15 degrees and the flow supply source is 4.5 l / s; (2) bio-climate sedative has a skin index of stress 12 and lung 30.

Post-traumatic sufferings through functional, somatic and psycho-behavioral consequences remain among the most common causes of consultation, investigations and therapeutic solutions arriving in the spa facility.

In recent years there have been efforts to promote health tourism and increasing addressability of active population for rehabilitation treatment in the spa resorts.

METHODS: Over a period of 6 months (March-August 2014) in Pucioasa resort were consulted 280 patients with post-traumatic disorders: 153 patients with sprains -ankle, knee and fist in order of frequency, 80 patients with fractures-tibial plateau, ankle, humerus, femur, wrist, 40 patients- bruises, sprains and 7 patients with complex trauma of wrist-hand region

All patients were evaluated clinically and functionally, at the beginning and at the end of treatment. They were also evaluated at mid-term treatment, being required some adjustments of the rehabilitation program. Treatment duration was 10 days and included a comprehensive program tailored to each case, consisting of electrotherapy, hidrokinetoterapie and kinesiology. Hidro-kinetotherapy was carried out as Sulphurous water baths at a temperature of 37.5 degrees Celsius for 20 minutes each day. There have been evaluated as indicators for assessing the effects of therapeutic program VAS score, measuring of mobility angles in the affected joints and ADL assessment.

RESULTS: Of the total treated patients, 104 were active people, who have resumed work after an average of 1.5 months. It was observed improvement from an average VAS score of 8.7 to 5.6, as well as improving degrees of mobility. 36 patients required resumption of the treatment after 3 months due to the complexity of posttraumatic sequelae.

DISCUSSION: Hidrokineto -Therapy in sulphurous water basin has many advantages for rehabilitation of patients with post-traumatic sequelae combined with all of the methods that form rehabilitation program: download of body weight determine the execution of the recommended exercises more easily; stimulating trophicity of the soft tissues by increasing circulation in the affected segments; shorten the length of rehabilitation up to half and treatment of other sufferings that can decompensate in post-traumatic context.

CONCLUSION: Hidrokineto -Therapy in sulphurous water basin has many advantages for rehabilitation of patients with post-traumatic sequelae combined with all of the methods that form rehabilitation program.

POST05

THE EFFECTIVENESS OF AQUATHERAPY IN THE TREATMENT OF CHILDREN WITH CEREBRAL PALSY: A SYSTEMATIC REVIEW

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INTRODUCTION: Cerebral palsy is the most common cause of disability in the children, with severe impact on quality of life. Aquatherapy is a useful type of treatment for children and adolescents with CP, in particular in the severe limitation of movements. In the last years a systematic review (2005) investigated this type of therapy but few studies showed the effectiveness. The primary purpose of this study is to examine the literature from 2010 to 2014, in a systematic way, with a focus on the effectiveness of the treatment in the water about the quality and quantity of movements. The secondary purpose is to evaluate the measures of outcome and the specific program used in the studies of the review.

METHODS: A search of Cochrane, Cinahl, PsycINFO, Embase, Medline will to conducted. Randomized control trials (RCTs) will only to include. The participants in these studies were aged between 0-16 years of age.

POST31

AQUA CARDIO RECOVERY - CONVERSION OF THE TECHNOLOGIES OF HIGH PERFORMANCE SWIMMING TO THE PREVENTION OF CARDIOVASCULAR DISEASES OF THE POPULATION

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INTRODUCTION: According to World Health Organization (WHO), cardiovascular diseases are the leading cause of death among the population of most countries, coronary heart disease being the most notable.

The benefit of swimming for recreational purposes is well known, and everybody knows the ancient phrase «in vino veritas in aqua sanitas», which lets us talk about the huge potential of the aquatic activities and swimming in purposeful drug-free influence on the modified cardiovascular risk factors.

METHODS: For this work we've used AQUA CARDIO RECOVERY - The health-care technology developed by the authors of this article. This direction is based on the effect of interval training in the high performance sport, when the workload is set by the interspace between the exercises.

Given the reduced motor activity of patients caused by everyday lack of exercise due to sedentary lifestyle of office workers and the use of automobiles, which reduces the motor activity, we have developed a technique for prevention of cardiovascular diseases among adults, which we called AQUA CARDIO RECOVERY.

The lessons were held in group of 11 adults $56,6 \pm 3,7$ years old. The lessons took 45 minutes twice a week with the water temperature 28C.

The schedule of training in the pool included using distance-based exercises on swimming 25 to 100 meter sections with the low-intensity aerobic workload, considering the individually optimal heart rate to be less than 120 bpm. (60 to 70 per cent of individual max heart rate).

The distinct feature of the proposed AQUA CARDIO RECOVERY technique is reaching the minimum possible heart rate during the recovery between the exercises. Both before and after the exercise both heart rate and blood pressure of each patient was measured, patients were interviewed inspected.

CONCLUSION: The classes held according to technique during 3 months achieved improving the general well-being, coronary bloodstream, myocardial perfusion and developing the collaterals, increasing systolic output and left ventricular ejection fraction. These results allow us to recommend the developed technique to use in the health-care programs.

POST15

EFFICACY OF AQUA CYCLING ON PAIN AND PHYSICAL FUNCTIONING IN PATIENTS WITH KNEE OSTEOARTHRITIS - A STUDY PROTOCOL

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INTRODUCTION: Aqua cycling is a fitness phenomenon gaining popularity across Europe. Previous research on rehabilitation after anterior cruciate ligament reconstruction and total knee surgery showed that aqua cycling in addition to usual care resulted in greater improvement in knee joint mobility and faster reduction of knee joint swelling. A small pre-post-test study with 19 rheumatic patients showed a positive influence of group-based aqua cycling on well-being, strength and mobility (3). Although, aqua cycling seems obvious as exercise treatment for patients with knee OA no studies have yet investigated the effects of aqua cycling in a therapeutic setting. The purpose of the trial is to assess effectiveness of aqua cycling in knee OA patients on knee pain and physical function.

METHODS: Design: The study is a randomized controlled trial (RCT). It will be performed at the department of orthopaedic surgery and the department of physiotherapy of Maastricht University Medical Centre (MUMC) and the department of epidemiology of Maastricht University. Population: Inclusion criteria are knee pain on Numeric Pain Rating Scale > 4 and < 7, Kellgren/Lawrence score < 3 and an indication for physiotherapy. Exclusion criteria are severe, unstable co-morbidities, (planned) total knee replacement, corticosteroid injection < 3 months, intra-articular hyaluronic acid injection < 6 months, hip OA and inflammatory joint diseases. Recruitment: The nurse practitioner or orthopaedic surgeon will identify eligible patients during the early OA consultation hours of the MUMC. After given written informed consent patients will be randomly assigned to either usual care or to the aqua cycling programme. Interventions: Usual care includes lifestyle advices, risk factor management, pharmacological treatment and referral to a physiotherapist. The intervention group will participate in a 12-weeks aqua cycling exercise programme with two 45-minutes sessions weekly. The main part of the training consists of cycling in a sitting position with good postural control. In addition, out-of-the-saddle positions and exercises for the upper body are incorporated. Outcome will be measured at 12 and 24 weeks after baseline assessment using the Knee Injury and Osteoarthritis Outcome Score (KOOS) on physical function and knee pain. Secondary outcomes are performance tests of physical function and functional capacity (timed up and go test, six-minute walk test), isometric and isokinetic knee extensor/ flexor muscle strength (Biodex), general disease severity (patient global assessment), level of physical activity (short questionnaire to assess health-enhancing physical activity (SQUASH)) and quality of life (Short Form Health Survey (SF-36)). Process evaluation includes assessment of adherence rates and evaluation of diary records on physical function, (knee) pain and level of physical activity.

RESULTS; Results of this trial will be available in 2016. We hypothesize that the aqua cycling exercise programme will improve knee pain and physical functioning in patients with knee OA.

CONCLUSION; To our knowledge this is the first RCT investigating the efficacy of aqua cycling on the impairments due to knee OA.

POST08

TRANSLATION AND CROSS-CULTURAL ADAPTATION OF S.W.I.M. SCALE.

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INTRODUCTION: Very few studies have investigated protocols to measure aquatic motor performance. This kind of instrument can help clarifying the effects of different interventions in the aquatic environment. Swimming with The Independent Measure (SWIM) is a toll to assess the development of skills of children with physical or learning disabilities and guide intervention programs performed in the swimming pool (Srsen et al., 2012). This study translated the Swim scale to Portuguese and cross-culturally adapted it to Brazilian Culture.

METHODS: After the Halliwick Association of Swimming Therapy authorization, the translation and cross-cultural adaptation method was based in the Guillemin *et al.* (1993) and Beaton *et al.* (2000) guidelines. The recommended steps are translation, translation synthesis, back-translation, the expert committee synthesis and pre-test. The pre-test was analyzed in two ways, with the analysis of 20 physiotherapy and physical education professionals and with the assessment of 20 healthy children. After that, the last version of S.W.I.M. scale in Brazilian Portuguese was concluded.

RESULTS: Two Brazilian Portuguese natives translated the scale to Portuguese. Two professional translators, three physiotherapists specialized in Aquatic Physiotherapy and one PhD with experience in the use of scales performed the synthesis of translations. Back-Translation was performed by two translators, who were fluent in both languages and native English speakers. The committee of experts constituted of three physiotherapists specialized in Aquatic Physiotherapy, one PhD experienced with measuring instruments and all the translators to synthesis the translations. After applying the pre-test, a new discussion was necessary with a Committee of Experts (3 PhD experienced in the use of scales and two aquatic physiotherapists). Final doubts were presented and clarified by the Halliwick Association of Swimming Therapy, and the final version was completed.

DISCUSSION: A systematic process of translation and cultural adaptation with qualified professionals participating on each phase was necessary to debate the terms and maintain the characteristics of the translated version of the instrument.

CONCLUSION: SWIM scale was translated to Portuguese and culturally adapted to Brazil. The application of the preliminary version in the Brazilian population is the last stage to evaluate the quality of the SWIM - Brazilian Portuguese version.

POST18

EFFECTS OF AN AQUATIC THERAPY PROGRAM IN BALANCE, AND RISK OF FALLS, IN OLDER ADULTS: A SYSTEMATIC REVIEW

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INTRODUCTION: Balance is a fundamental ability in older adults, and their malfunction is one of the main causes that lead to falls¹. Fall is considered one of the most important change factors in their lives, because of the restrictions that this may cause, severely affecting the quality of life of the older adults¹. Aquatic Therapy programs have often been recommended for these population, because they have a safe environment, less subject to falls and with good acceptance and adherence to treatment^{2 3}. The aim of this systematic review was to gather and analyze existing research on the effects of Aquatic Therapy programs in balance and risk of falls in older adults.

METHODS: The research was conducted in Pubmed and Sport Discus (EBSCO) databases from 20 December 2012 and 19 February 2013. The PICO model was used in the selection of the articles, and the keywords used were: elderly, 'aquatic therapy', hydrotherapy, balance, 'risk of falls'. Studies: randomized controlled trials (RCT) or quasi-experimental studies. Population: over 60 years, independent in ADL. Interventions: Aquatic Therapy programs. Outcomes: balance, risk of falls. Methodological quality was assessed with the PEDro scale⁴ (RCTs) and by the Levels of Evidence⁵ (quasi-experimental studies).

RESULTS: 285 articles were identified. After title and abstract check 43 articles were deemed potentially relevant. After reading the full text, 12 articles were selected to include in this systematic review. The RCTs ratings ranged from 7 to 9 in the PEDro scale (0-11) and the quasi-experimental studies were ranged with 2b in the Levels of Evidence (1-5). In all RCTs, participants were randomly allocated and all studies were similar at baseline for demographic characteristics. Care provider was never blinded, patient blinding occurred in 4 trials and evaluators blinding occurred in 3 trials. The samples used ranged from 11 to 79 persons and mean age ranged from 65 to 80 years. The intervention period ranged from 4 to 20 weeks with 2 to 3 sessions a week (between 40 to 60 minutes for session). Water temperature was between 28° and 34° C.

DISCUSSION: There were significant changes in 9 studies regarding the outcomes studied. Two studies found improvements in balance in aquatic therapy and land groups, however no significant differences were found between the 2 groups. There were significant improvements in the balance in the aquatic therapy group when compared with the control group in 4 studies and when compared with the land group in 3 studies. Regarding exercise programs, only 6 of them specifically described the whole program, while the remaining didn't, thus hindering the recommendation of a certain protocol specific to the elderly population relative to balance and risk of falls.

CONCLUSION: There are scientific evidence regarding the positive impact of an aquatic therapy program in older adults in balance and consequent reduction in risk of falls. However, future studies with more rigorous study designs and with more structured and outlined programs are needed to prove the efficacy of this modality in balance and risk of falls in this population.

POST29

ASSESSMENT OF REPEATABILITY AND RELIABILITY OF 3 DIFFERENT PROTOCOLS FOR 3D UNDERWATER GAIT ANALYSIS

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INTRODUCTION: Water environment has been widely employed for different rehabilitation therapies, however little is known regarding the repeatability of state of art gait analysis protocols in underwater conditions. Underwater gait analysis mainly relies on video based techniques for tracking of features (TOF) in order to perform joints kinematics analysis [1]. This investigation aims to assess repeatability and reliability of 2 gait analysis protocols when applied to UW gait ([2] referred as CAST, [3] as IOR_gait) and a method for direct tracking of joint centers (DTJC) [1]. The same protocols were also applied in out of water (OW) conditions on the same subjects and 3D joints angles estimated.

METHODS: Three healthy subjects (mean±SD age 27.3±5.5 and BMI 21.3±2.6) participated in the study. After signing informed consent subjects were instructed to walk at their preferred speed within two different set up: UW within a swimming pool (water height of 1.2m) and OW in a gait lab (3 trials per subject in each condition were collected). Indelible ink marker was used to trace the 2 different markersets [2,3] (Figure 1). Conventional UW analogic cameras (Sony Hyper Had, TS-6021PSC, Japan, 50 Hz) were connected to a computer and UW and OW gait analysis was performed. The cameras were automatically synchronized as in [1]. The calibration of the cameras' intrinsic parameters was achieved from a dry land acquisition of a checkerboard pattern and corrected for UW [1]. A software developed for automatic tracking of UW movements [1], was used for TOF. Data were processed (Matlab R.13) and anatomical landmarks, JC trajectories, and joint rotations, were extracted. Inter-operator repeatability (3 different operators executed TOF of the same subject's 3 video sequences) and intra-operator repeatability (the same operator executed 3 times TOF of the same subject's 3 video sequences) were assessed. Root mean square distance (RMSD) was adopted in comparing the 3 different techniques outcome measures (as applied to 1 trial) and in comparing the ones related to the repeatability tests.

RESULTS: Inter-operator and intra-operator (Table 1) repeatability results showed better performance of CAST with a RMSD_{max}=38° on ankle joint internal/external rotation (I/E) for IOR_gait inter-operator repeatability test, and RMSD_{min}=1.0 on hip flexion/extension (F/E) for CAST inter-operator repeatability test. Comparison among methodologies showed good to poor results with a RMSD_{max} of 60° for the ankle I/E and of 3.3° for the hip F/E when comparing CAST vs IOR_gait OW. CAST showed better results also in presence of occlusion and low resolution images. DTJC showed compressively the worse performance in term of repeatability analysis, even though it allowed kinematics parameters estimation of each joint on the sagittal plane for the complete dataset.

Table 1: Intra-operator repeatability results ([1]vs[2]). A/A=abd-adduction.

Intra-operator [RMSD]	Hip F/E	Hip A/A	Hip I/E	Knee F/E	Ankle F/E	Ankle A/A	Ankle I/E
[2] Tracking 1-2	1,0	1,5	5,6	1,5	2,7	3,0	6,9
[2] Tracking 1-3	3,7	1,9	10,1	2,2	2,0	2,0	6,3
[2] Tracking 3-2	3,1	1,7	5,2	1,3	3,1	2,3	6,1
[1] Tracking 1-2	1,7	0,5	3,3	1,0	2,0	2,9	2,0
[1] Tracking 1-3	3,5	1,1	17,1	2,1	2,3	2,1	2,6
[1] Tracking 3-2	3,8	1,4	19,8	1,3	3,1	2,6	3,0

DISCUSSION: Both protocols lead to reliable results for joints angle rotations (good repeatability) suggesting their applicability in UW gait analysis; compared to DTJC. They enabled standard gait analysis 3D joint angles estimation. UW data processing showed better results perhaps because of better quality of UW images due to the specific experimental set up.

POST10

AQUATIC THERAPY IN THE TREATMENT OF PEOPLE WITH SEVERE MENTAL ILLNESS

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INTRODUCTION: Mental disorders are a major problem because of its high prevalence (15 and 25% of the general population suffers) and it is expected that these figures will increase in the future. The Serious Mental Illness (SMI) encompasses several psychiatric diagnoses (schizophrenia, bipolar disorder, depression). People who suffer with severe difficulties in personal and social functioning, which reduces their quality of life. The overall objective of this study focuses on estimating the effectiveness of aquatic therapy techniques included in a program of Occupational Therapy (OT) to improve the quality of life related to health (HRQOL), occupational performance in core activities daily living (ADL), social and physical skills, and the mood in people with severe mental illness (SMI) without cognitive impairment.

METHODS: Prospective experimental study in parallel, randomized, will try to assess the efficacy of techniques aquatic therapy in people with severe mental disorder Mental Health devices Mallorca. The limited number of RCTs and variability of the interventions themselves makes it difficult to follow a common line for this study. It will include an experimental group that will participate in aquatic therapy program (24 sessions over 3 months, 2 times a week, lasting 30 to 40 minutes) and a control group who continue treatment as usual. All aquatic therapy sessions include the following structure: change of clothes, shower, pool entry, intervention (heating, individual exercises, exercises for couples or group exercises, relaxation) shower, change clothes and feedback (feedback). This study will follow the CONSORT recommendations. Patients in both groups will be evaluated week at baseline and at the end of the intervention. The instruments used to assess program effectiveness are studied HONOS Scale (Health of the Nation Outcome Scales), SF-36 scale Bels (Basic Everyday living Schedule). TEST to 'get up and go' and satisfaction questionnaire program aquatic therapy. The results are stored in a database and subsequently analyzed using SPSS version 16.0.

RESULTS: Are expected to return results can demonstrate the effectiveness of aquatic therapy techniques included in a program of Occupational Therapy to improve increase the quality of life related to health, occupational performance in core activities daily living, social and physical skills, and the mood in people With Mental severe illness.

DISCUSSION: In 1960 Pishkin showed that water temperature influences the nervous excitability, attention and reaction time of people with schizophrenia also hydrotherapy and studied Shevchuk et al (2007) and Harmon et al (2009) may serve as a complement to pharmacological treatments to calm patients. We also have evidence that hydrotherapy is effective in the treatment of behavioral and social aspects of autism spectrum disorder Mortimer reviewing this year. Furthermore there is evidence that aquatic therapy helps people improve mood, these studies have been conducted in the field of physical rehabilitation, as the study of Munguia et al (2008) with people with diseases such as fibromyalgia, work Hejazi and et al (2012) with people who suffer multiple sclerosis, and Aidar study and et al (2013) with people who have a stroke.

POST20

ANALYSIS OF FUNCTIONAL CAPACITY IMPROVEMENT AND DECREASE OF FALL RISK IN AN INDIVIDUAL WITH PERIPHERAL NEUROPATHY AFTER AQUATIC THERAPY PROTOCOL: CASE REPORT

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INTRODUCTION: Peripheral neuropathy is a general term which describes damage of peripheral nerves. Usually presents progressive characteristics with motor and respiratory compromise, and still has not a cure. Although aquatic physiotherapy plays an important role in the treatment of these people, enabling movements which are often not possible on land or offering the possibility to functional movements out of the water. The ICF provides a holistic model to disability issues and is an important tool regarding to functional capacity of body functions and structure, activity, social participation, personal and environmental factors. The objective study is to analyze the effectiveness of individual aquatic physical therapy to improve gait pattern and fatigue, reduce number of falls. Study was based on the client complaint, difficulty in gait, frequent falls (one fall per week), and fatigue while walking short distances.

METHODS: Subjects were males with 49 years in aquatic physiotherapy treatment in group at Saga Rehabilitation and Physical Therapy, twice a week since 2009 with decrease of motor function in the last year, affecting his professional, personal and social life.

According to treatment, follow up a new assessment was performed indicating individual aquatic therapy for three months, twice a week. Goals were set according to International Classification of Functioning (ICF). Timed Up and Go (TUG), 6-minute walk test, Berg Balance Scale (Berg) and visual analysis were used as measuring instruments before and after intervention. Protocol was designed composed by static and dynamic balance, functional exercises and walking with different directions, speed, depth and intensity of effort.

RESULTS: Significant improvement in gait pattern by visual analysis, only one fall during intervention period. Borg Scale and 6-minute walk test showed an improvement of 44% in walking distance and effort and improvement of 39% in TUG Test. In Downton and Berg there was no change in the assessed items.

CONCLUSION: A good follow up and evaluation to identify specific goals necessary to improve functional capacity and the best intervention to achieve these goals. In this case report individual intervention was more effective than group to improve functional activities for the person with peripheral neuropathy.

POST11

HYDROTHERAPY AS AN ADJUNCT TO PHYSIOTHERAPY MANAGEMENT IN AN INFANT WITH OBSTETRIC BRACHIAL PLEXUS PALSY: A CASE REPORT

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INTRODUCTION: Obstetric brachial plexus palsy (OBPP) is one of the most complex traumatic peripheral nerve injuries, which frequently leads to considerable physical disability with progressive psychological and socioeconomic problems. A dynamic and comprehensive physiotherapy programme is highly important and absolutely necessary for its management. A variety of physiotherapeutic procedures are performed to support any spontaneous nerve recovery as well as to prevent and treat the consequences of denervation, such as pain, muscle weaknesses, atrophies, contractures, somatosensory deficits, subluxations/dislocations and motor dysfunctions. Hydrotherapy is used as an additional physiotherapeutic modality in the OBPP rehabilitation. However, there is no evidence in the published literature to suggest the use of hydrotherapy for the management of infants with OBPP. The purpose of this study was therefore to investigate for first time the feasibility and efficacy of a specific 4-month hydrotherapy programme, as an adjunct to early physiotherapy intervention, on upper extremity functional movement in an infant with OBPP.

METHODS: In this case report a 3-month-old female infant with left Erb's palsy, presented with muscle weakness and loss of motion with typical "waiter's-tip" position of the arm. The infant participated in 17 hydrotherapy sessions of 45 minutes each (once a week). The hydrotherapy programme was conducted in an indoor therapy pool, heated to 32°C, by a specialized and experienced paediatric physiotherapist. The hydrotherapy programme included specific therapeutic exercises, through therapeutic handling and holding strategies based on the philosophy of Halliwick®-Aquatic Therapy and Bobath/Neurodevelopmental Treatment, for facilitating the active movement, maintaining the range of motion and enhancing the sensory perception of the involved arm. The infant received a standardized physiotherapy programme twice a week (since she was 25 days old). Active Movement Scale (AMS) and videotaping prior to and after the intervention were used for recording potential improvements.

RESULTS: Improvements in upper-extremity joint movements were found on AMS. Specifically, measures have shown an increase in shoulder flexion by 3 points (from 2 to 5), in shoulder abduction by 3 points (from 2 to 5) and in shoulder external rotation by 2 points (from 0 to 2). There was an increase in elbow flexion by 4 points (from 2 to 6) and in forearm supination by 1 point (from 0 to 1). The wrist extension was increased by 2 points (from 5 to 7). Overall, there was a significant enhancement in the six tested movements that averaged 36%. Also, improvements in functional use of the affected arm were documented by videotaping the use of the arm in functional bilateral activities, such as splashing around in water, reaching and grasping a toy, bring the hands or/and a toy to mouth.

CONCLUSION: The findings demonstrate that hydrotherapy combined with physiotherapy intervention, may improve the motor function in an infant with OBPP. It is recommended that hydrotherapy may have a role in maintaining muscle extensibility and joint range of motion as well as in enhancing motor recovery of the involved limb.

POST17

BALANCE TRAINING AND ASSESSMENT IN AQUATIC PHYSICAL THERAPY – WORKSHOP

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INTRODUCTION: Fall prevention has a high priority in physical therapy for elderly, specifically when they suffer from a neurological disease. Research however doesn't support the added value of dry land fall prevention. Active elderly fall equally often compared to those that are passive.

Balance training in fall prevention therefore is overestimated and can hardly be used for patients who score less than 45 points at the Berg Balance Scale (BBS). The reason is that task-specific training is not possible in those patients. During aquatic balance training, task specific parameters like velocity, power, equilibrium-, stepping- and brake-reactions as well as contextual interference can be trained intensively in the context of differential learning.

METHODS: Part one consisted in Balance assessment: the cornerstone of good treatment. This includes a physiotherapeutic assessment (sensibility, equilibrium reactions and muscle patterns) and with the participants we'll discover which sensibility modalities give the brain the right information and what older or disable people feel. This "other" feeling and the reduced muscle patterns make it very difficult to design an good balance system for a damaged brain. The goal is to establish the still existing possibilities of a patient. Specialized medical assessment involving vision, hearing, labyrinth and vestibular function will not be included in this part, but will be cited to discuss the symptoms.

Part two consisted in developing a treatment plan in which topics like intensity, dose and (group) design will be addressed. Where exercise and motor learning (Differential-learning) merge, a brain can be stimulated optimally in other to enhance balance.

DISCUSSION: We do know that intensive movement is beneficial in Alzheimer patients for hippocampus activity, as measured with MRI. The authors concluded that intensive movement slows down the disease process. Intensive movements with a high dose are thus important for an exercise design. On land this combination frequently is hardly possible for older persons, especially in neurology and psycho-geriatrics. Aquatic balance training offers the possibility for intensive training.

Measures of balance like the BBS give an indication of the difference in skill before and after the treatment. The BBS does not consider an age factor or differences in physical condition amongst persons. This means that we do not know the physiological decline in balance in the elderly (healthy and with a disease, e.g. dementia) and therefore therapeutic interventions cannot be judged reliably. Also comparing aquatic and land interventions therefore cannot be done reliably.

CONCLUSION: Balance exercise in water enables us to train balance with the correct speed, balance correction and step strategy. This can be done in small groups (4 persons) and still monitor intensity in a safe setting.

POST01

AQUATIC EXERCISES FOR INDIVIDUALS WITH CEREBRAL PALSY

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There is growing body of the literature about importance of exercise for individuals with cerebral palsy (CP) by the ICF perspective (WHO, 2001). In the mean time, dynamic systems theory stimulates further attention on individual's active participation a therapy in order to integrate subsystems such as muscle strength and cardiorespiratory endurance (Thelen, 1989). These philosophical changings facilitate an approach, which is identified, as "exercise is a key strategy" for individuals with physical disabilities. The approach is valid for the individuals with CP, who have some risks such as fatigue, decreased working efficiency and activity motivation in land (Kelly & Darrah, 2005). Performing exercise and physical activity in land could be disadvantages in terms of gravity for individuals with CP, especially for the GMFCS level 4-5. Thermal and mechanical advantages of the water may be facilitated their participation in aquatic exercise program more intensive and duration (Gorter & Currie, 2011). The presentation focuses on subtopics such as physical fitness and motor performance level of the individuals with CP, difficulties of the performing land-based exercises and physical activity, why aquatic, evidence level, aquatic exercise prescription, teaching tips for aquatic intervention, adapted strategies for swimming, and aquatic techniques for individuals with CP.

POST25

THE ROLE OF HYDROTHERAPY IN THE REHABILITATION PROGRAM AFTER SHOULDER ARTHROPLASTY: OUR EXPERIENCE IN A CASE SERIES

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INTRODUCTION: rehabilitation after shoulder arthroplasty has been investigated in the past years and seems to give fundamental contribution for a good final outcome. However few studies have considered the role of hydrotherapy in the treatment of these patients.

METHODS: in the last 12 months we have conducted the rehabilitation program of 13 patients (6 men and 7 women, mean age 71). We have added to the common therapies of passive mobilization and light progressive reinforcement, the use of a warm pool for early mobilization and activation of the upper extremity muscles.

S.p.a.d.i. evaluation form was administered at 6 months post-op.

RESULTS: all patients reached a satisfying final outcome in terms of pain relief and functional recovery with a mean elevation in scapular plane of 130°. All of them enjoyed the execution of exercises in warm water.

The compilation of the s.p.a.d.i. questionnaire, gave a mean result of 22 (50/8)

Points; especially the total pain score was really low, with a mean score of 3,5 (5/2) points.

DISCUSSION: this study has no claim to clarify the efficiency of hydrotherapy in the rehabilitation of patients after shoulder arthroplasty. We don't have a control group and the treatment group is small and not homogeneous (4 shoulder arthroplasty and 7 reverse shoulder arthroplasty). However we believe in the validity of the treatment: in our opinion, the integration of exercises in warm water seems to reduce the risk of stiffness and gave to patients, a better comfort in the first phases of the rehabilitation program.

CONCLUSION: the execution of exercises in warm water are very well tolerated by patients, and in our opinion can add to a standard rehabilitation program, a better comfort with minor risk of stiffness and a reduction of pain. We hope in the future randomized trial will be done, to better investigate the efficiency of hydrotherapy.

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