

NO. 1

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Daily Physical Activity 6 Years Beyond Clinical Rehabilitation: Protocol of the ReSpAct 2.0 Study

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- ▶ **BACKGROUND** The Rehabilitation, Sports and Exercise (RSE) program is an evidence-based physical activity (PA) promotion program implemented in Dutch rehabilitation care. The Rehabilitation, Sports and Active Lifestyle (ReSpAct) study was designed to evaluate the RSE program, in which participants were followed from discharge up to one year after rehabilitation. However, little is known about PA behavior on the long-term. PA outcomes such as energy expenditure or time spent physically active are commonly measured with activity monitors and questionnaires, based on algorithms developed for healthy adults. But, energy cost of ADL has potentially other dimensions and may be differently perceived in people with physical disabilities or chronic diseases.
- ▶ **AIM** (1) To evaluate PA behavior and its potential determinants 6 years beyond rehabilitation, and (2) to gain a better understanding of measuring daily PA in people with physical disabilities or chronic diseases.
- ▶ **METHODS** Participants of the ReSpAct study (n=1200) will be invited for an additional follow-up measurement 6 years after rehabilitation. Using questionnaires we will collect information on PA behavior, and potential determinants explaining differences in PA behavior between participants. In addition, a subgroup (n=100) will be invited for an experimental study examining the energy-related outcomes of several activity monitors and PA questionnaires, and compare these with the gold standard indirect calorimetry.
- ▶ **RESULTS** Data collection will start in November 2019, which will result in a large unique database in a heterogeneous cohort.
- ▶ **DISCUSSION** The results of the ReSpAct 2.0 study will provide new insights into participants PA behavior on the long term. These insights can optimize PA promotion interventions during and after rehabilitation, especially on sustainability. Furthermore, it will provide a better understanding of measuring daily PA in people with physical disabilities or chronic diseases.

NO. 3

Bouma A^{1,2}, van Nassau F³, Kroops L¹, van der Ploeg H³, Nauta J³, Verhagen E³, van der Woude L¹, Dekker R¹, on behalf of the PIE-M consortium

Needs assessment to explore requirements for a tool to support exercise as medicine in hospital care

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- ▶ **Introduction:** The prescription of exercise in clinical care has been advocated worldwide through the 'exercise is medicine' (E=M) paradigm. However, E=M currently has no position in general routine hospital care. Within this project we aim to facilitate E=M prescription in practice. Therefore, the aim was to develop a blueprint of treatment options regarding E=M. This blueprint is used to develop an E=M tool to implement E=M in hospital care and to identify the needs and opportunities in local context.
- ▶ **Research question:** What are the important points of decision for implementation of E=M in hospital care, in the context of developing an E=M tool?
- ▶ **Methods:** A mixed method approach was used (i.e. questionnaires and interviews) to gain more insight into the needs and opportunities that are experienced regarding the implementation of E=M among 22 hospital clinicians (medical specialists, residents, physician assistants, nursing practitioners) lifestyle coaches and hospital managers in 5 clinical departments in two Dutch academic hospitals. Outcomes feed into the blueprint of the implementation of E=M.
- ▶ **Results:** Interviewees indicated that they preferred a digital instrument for hospital clinicians that is linked to existing hospitals' electronic medical records. It should help them to select eligible patients for referral to active lifestyle interventions, and provide them with an indication for tailored lifestyle interventions. Personal characteristics, such as age, gender, diagnosis, co-morbidity, current PA behavior and motivation to change should be measured to indicate the urgency to be more physically active and the need for lifestyle coaching. The E=M tool should generate a 'tailored' exercise advice for patients that predicts, how patients will benefit from more exercise and generate referral options for clinicians.
- ▶ **Conclusions:** A blueprint for E=M in clinical care can be used to tailor an E=M tool to the needs of clinicians. A pilot study is planned to test an E=M tool and E=M treatment options in clinical care.

NO. 2

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Functional capacity and cognitive function are diminished in frail and pre-frail elders

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- ▶ **INTRODUCTION:** Frailty is characterized by diminished physiologic reserves that lead to higher vulnerability to stress factors. Cognitive performance and physical fitness are considered reduced in individuals suffering from frailty, but the evidence of its cause-and-effect relationship is still lacking. **OBJECTIVE:** To describe and compare scores of functional capacity and cognitive performance amongst frailty groups.
- ▶ **METHODS:** This is a cross-sectional study of 90 community-dwelling elders (74.44 ± 6.24 years; 58.9% female). Frailty was assessed through the phenotype of frailty. Global cognitive performance was assessed using the Montreal Cognitive Assessment (MoCA). Physical performance was measured through the Up & Go Test (UG) and six-minute walk test (6MWT). Comparisons between frailty groups were performed with ANCOVA and adjusted for age.
- ▶ **RESULTS:** The prevalence rates of the frail, pre-frail, and robust categories were 16.7%, 43.3% and 40%, respectively. Compared to the robust, the frail group showed significantly lower mean MoCA (19.54 ± 1.03 vs 23.93 ± 0.67, p = 0.003), UG (8.56 ± 1.06 vs 4.68 ± 0.17s, p = 0.001), and 6MWT (381.83 ± 49.61 vs 591.66 ± 15.44m, p = 0.004) values. Similarly, the pre-frail group, compared to the robust, displayed significantly lower mean MoCA (21.11 ± 0.62 vs 23.93 ± 0.67, p = 0.01), UG (5.70 ± 0.22 vs 4.68 ± 0.17s, p = 0.004), and 6MWT (491.52 ± 21.33 vs 591.66 ± 15.44m, p = 0.037) values. Differences between the frail and pre-frail groups were not significantly different (p > 0.05).
- ▶ **CONCLUSION:** Frail and pre-frail elders exhibit poor cognitive function and functional capacity compared to the robust. Elders should be encouraged to adopt multidomain strategies in order to delay the onset of frailty.
- ▶ **Acknowledgments:** The authors would like to thanks to CIAFEL—Research Centre in Physical Activity, Health and Leisure (UID/DTP/00617/2019), Instituto Português do Desporto e Juventude - "Mais Ativos Mais Vividos" Program and to the project "Body and Brain" (POCI-01-0145-FEDER-031808).

NO. 4

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Effects of Resistance Exercise for Young Adults with and without Analogue Generalized Anxiety Disorder

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- ▶ **Recent meta-analyses** support chronic anxiolytic effects of resistance exercise training (RET) among women with diagnosed Generalized Anxiety Disorder (GAD). However, less is known regarding the effects of RET among those with subclinical, or analogue, GAD (AGAD). Recent findings showed positive acute effects of aerobic exercise on worry and state anxiety among young adult men and women with and without AGAD, but less is known about the acute and chronic effects of resistance exercise (RE). The purpose of the randomized controlled trial (RCT) detailed in this protocol was to quantify the acute and chronic effects of RE on signs and symptoms of GAD among young adults with and without AGAD. This protocol details the full methods of two parallel, RCTs of an eight-week RET intervention compared to an eight-week wait-list control condition among young adults with and without AGAD. AGAD status was determined using validated cut-scores for both the Psychiatric Diagnostic Screening Questionnaire GAD subscale (≥6) and the Penn State Worry Questionnaire (≥45). The ecologically-valid RE intervention was designed according to World Health Organization and American College of Sports Medicine guidelines, fully supervised, and delivered on a one-to-one basis. The primary outcome was AGAD status, assessed pre- and post-intervention. Two acute RE trials were nested within the design at pre- and post-intervention to determine response and change in response to a single bout of RE. This is the first RCT to examine the effect of an ecologically-valid RET intervention among young adults with subclinical levels of GAD. Given that GAD most often emerges during young adulthood, and young adults who display elevated subclinical symptoms are more likely to develop clinically significant psychopathology, investigating the effects of RET among individuals with emerging signs and symptoms of an anxiety disorder is particularly important.

NO. 5

Chien KY¹, Yang AF, Kann NW³, Tien YT¹**Effects of Water-based Exercise on Cardiovascular Parameters in Prehypertension Postmenopausal Women**1. GRADUATE INSTITUTE OF SPORTS SCIENCE, *National Taiwan Sport University, Taoyuan, Taiwan.*2. INSTITUTE OF SPORTS SCIENCES, *University of Taipei, Taipei, Taiwan.*3. CENTER FOR GENERAL EDUCATION, *Taipei Medical University, Taipei Medical University, Taipei, Taiwan*

- **Introduction:** The deficiency of estrogen increased the risk of cardiovascular disease when women were postmenopausal. Studies have demonstrated that exercise can reduce cardiovascular disease and overall risk of death. It is still unclear the effects of water-based combined of cardiorespiratory and resistance training on cardiovascular parameters in prehypertension postmenopausal women. Research question(s)/hypotheses: The purpose of this study was to investigate the effect of three months of water-based exercise on cardiovascular biomarkers in prehypertension postmenopausal women.
- **Methods:** Thirty postmenopausal women and age under seventy years old were recruited as participants in present study. Participants were divided into three groups: prehypertension group (PHG, systolic blood pressure ≥ 120 mm/Hg before training, $n=12$, 61.5 ± 5.28 years old), normal blood pressure group (NBPG, systolic blood pressure ≤ 120 mm/Hg before training, $n=11$, 57.6 ± 4.53 years old), and control group (CG, $n=7$, 56.2 ± 2.49 years old). The PHG and NBPG performed three months combined aerobic and resistance water-based exercise training (two times a week, 55 minutes per time). All participants performed body composition, vascular elasticity, heart rate variability (HRV) and biomarkers at pre and post-exercise training.
- **Results:** The reduction changes of systolic blood pressure, pulse press, ASI and Low frequency of HRV in PHG was higher than NBPG. The reduction change of AGEs in PHG was significantly lower than NBPG. However, the changes of nitric oxidase, homocysteine, Hs-CRP, fasting blood sugar, triglycerides, high-density lipoprotein, and low-density lipoprotein were similar in three groups.
- **Discussion:** The three-months water-based exercise program improved blood pressure and blood vessel elasticity in prehypertension postmenopausal women. The reason for the improvement may come from exercise training to reduce the sympathetic activity, not the change in blood biochemical values in postmenopausal women.

NO. 7

Gerrits HL^{1,2}, Visser D³, and Wattel EM³**The talk test to evaluate exercise responses in frail elderly patients during orthopaedic geriatric rehabilitation**1. VRIJE UNIVERSITEIT AMSTERDAM, *Faculty of Behavioral and Human Movement Sciences, Amsterdam Movement Sciences, The Netherlands*2. MEREM MEDICAL REHABILITATION, *Hilversum, The Netherlands*3. AMSTERDAM UMC – VRIJE UNIVERSITEIT AMSTERDAM, *Department of General Practice & Elderly Care Medicine, Amsterdam Public Health, The Netherlands*

- **Evaluation of exercise responses** in frail patients admitted to orthopaedic geriatric rehabilitation (OGR) is challenging. This study aimed to investigate the feasibility, validity and reliability of a submaximal incremental cycling exercise combined with the Talk Test (GCE-TT) in patients during OGR. The GCE-TT was performed on a (wheel)chair based cycle ergometer. After each stage the patients' ability to speak comfortably was evaluated. The stage just before participants could no longer speak comfortably, the equivocal stage (EQ), was assumed to reflect the ventilatory threshold (VT).
- **Seventy-two patients** (>65 yrs) performed the GCE-TT. Seventeen of these subjects also performed the GCE with gas exchange measurements (GCE-GE) to obtain the VT, based on VO₂ and VCO₂ measurements and nineteen subjects repeated the GCE-TT on a second day (within 4 days). Workload (watts) and Heart Rate (HR) was monitored during both tests.
- **From all GCE-TT**, only 14% was completed. Reasons for early termination of the test were related to musculoskeletal discomfort/pain, not willing to continue or problems with the dual task (talking and cycling). No cardiorespiratory events occurred during the tests. VT responses could be detected in only 5 participants (primarily due to early termination of the test), where workload nor HR at EQ (36 ± 14 watt, 119 ± 14 bpm) were significantly different from VT (40 ± 6 watt, 102 ± 11 bpm), $P=0.285$. Strong correlations were found between workload at EQ and VT ($r=0.97$, $P=0.005$). In addition, HR at EQ and VT tended to be significantly related ($r=0.82$, $P=0.089$). Finally, Workload and HR at the moment of termination showed high reliability with ICC values >0.8 for all variables.
- **In conclusion**, GCE-TT seems feasible for patients in OGR to evaluate exercise responses in patients during OGR, although only a limited number of patients can complete the test. Difficulties are mostly related to musculoskeletal rather than to cardiorespiratory problems.

NO. 6

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Cost-effectiveness of international cardiovascular screening guidelines for adults1. SPORT AND EXERCISE MEDICINE DIVISION, *Department of Medicine, University of Padova, Padova, Italy*

- **The pre-participation screening guidelines** for cardiovascular (CV) diseases in adults engaged in sports vary between European (EAPCR) and American (ACSM) Scientific Societies with different sensitivity (Ermolao, 2019). The aim of this study was to analyze the cost-effectiveness of these guidelines and the feasibility of a full screening protocol.
- **This study evaluated** 525 adults (80% males, age 50[35-85] y) seeking medical screening before engaging in sports. The full screening protocol consisted in a clinical history, CV risk assessment, physical examination, resting ECG, maximal exercise test and, when required, further evaluations. Furthermore, the EAPCR and former ACSM guidelines were applied for each participant and costs were calculated based on the rates of the Italian National Health Service.
- **The full screening protocol** detected 100 previously unknown CV conditions (e.g. 38 complex arrhythmias, 21 coronary artery diseases (CAD), 4 myocardial bridges, 2 myocarditis, 1 cardiomyopathy). The cost for the full first-line screening was 53550 €; 232 patients required second-line evaluations, which accounted for a global pre-participation cost of 126903 € (242 €/patient, 1269 €/diagnosis). The EAPCR guideline uncovered 51 of 100 CV conditions; it was globally cheaper compared to the full protocol (147 €/patient, -39%), while the relative cost was higher (1511 €/diagnosis, +19%). The ACSM guideline missed less diagnoses; its global cost was cheaper (166 €/patient, -31%) while the relative cost per diagnosis was similar (1303 €, +3%) when compared to the full protocol.
- **The EAPCR screening** is less expensive but has lower sensitivity, leading to highest costs per diagnosis. The ACSM approach, which is primarily based on CV risk assessment, appears to be more cost-effective considering its higher diagnostic sensitivity. However, the full screening program with exercise testing allowed, with similar costs per diagnosis, the identification of several additional CV conditions.

NO. 8

Hanke AA, Wollstein J, Wiechmann K, Schieffer E, Tegtbur U, Kerling A

Analgesic Self-Medication in Marathon Runners – An International Survey in over 10.000 Marathoners1. INSTITUTE OF SPORTS MEDICINE, *Hannover Medical School, Hannover, Germany*

- **Introduction:** Marathon participation is increasing. However, ingestion analgesics before or during competition is common. Previous studies assume prevalence as high as 50%. In a pilot study at Hannover Marathon we found 17% of the runners ingesting analgesics.
- **Hypotheses:** According to discrepancy between literature and our results we reassessed our findings in a large international survey.
- **Methods:** Runners were contacted via marathon homepages, newsletters, or specific newsgroups in social media. Runners having participated in at least one marathon completed an internet based survey (German, English, Spanish, and Italian). Experiences with analgesics before or during a marathon and possible side effects were analyzed.
- **Results:** Out of 10.627 files 10.478 files were included. Exclusion was due to missing or incongruent data, or duplicates. $N=2416$ (23%) marathoners used analgesics; $n=8062$ runners did not (77%). These cohorts were defined as ANALG and CONTROL. 16.3% in ANALG intended to increase performance. In ANALG 98.8% had pain before the run already, 79.3% intended to reduce upcoming pain. 139 (5.8%) runners aimed to treat or prevent thromboembolic events. $N=631$ runners (26.1%) had other reasons for analgesic intake including 558 (23.1%) nominations of "flu" or "fever".
- **Experiencing** any possible side effect of analgesics had an odds ratio (OR) of 0.83 ($p=0.0004$) indicating less risks in ANALG. Risk for severe effects was higher in ANALG: Gastric bleeding: OR 2.4 ($p=0.0004$); liver dysfunction OR 3.3 ($p=0.0882$).
- **Discussion:** Incidence of analgesic self-medication is lower than previously reported. Generally, side effects of analgesic medication seem not increased. Severe problems as gastric bleeding or liver dysfunction are elevated. The latter showed a decent trend without statistically significant differences. Remarkable is that almost $\frac{1}{4}$ of the ingested drugs were taken to reduce fever or flu, which independently describes a high risk factor for severe health issues.

NO. 9

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Homebased Pilates for Symptoms of Anxiety, Depression, Fatigue among PwMS: Eight-Week RCT Protocol

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- **Evidence supports** positive effects of exercise on mental health outcomes among people with Multiple Sclerosis (PwMS). However, non-traditional exercise modes like Pilates remain understudied.
- **This study** will investigate the effects of immediate start home-based Pilates compared to delayed-start control condition on symptoms of anxiety, depression, and fatigue among PwMS.
- **Adults** (>18 years old) with physician diagnosed Multiple Sclerosis, Patient Determined Disease Steps (PDDS) score <3, who are free from any other significant physical or psychiatric condition, with no previous Pilates experience, and who have no medical contraindications to safe participation in physical activity will be randomised to two weekly home-based Pilates sessions guided by a DVD or delayed-start control. Well-validated questionnaires will assess symptoms of anxiety, depression, and fatigue at baseline and weeks two, four, six and eight of the intervention. Standardized mean differences and Hedges' d effect sizes will be calculated to quantify the magnitude of change within groups and the magnitude of between-group differences for home-based Pilates compared to delayed-start control condition. Based on recent feasibility findings we hypothesize that, compared to delayed-start control, immediate-start home-based Pilates will result in moderate-to-large improvements across outcomes.
- **This randomised** controlled trial will provide additional information regarding the feasibility of Pilates to improve mental health outcomes, and the magnitude of the effects of Pilates compared to a wait-list control on mental health outcomes among PwMS. These findings should inform both healthcare professionals and exercise scientists regarding the potential of home-based Pilates to improve management of several mental health symptoms prevalent among PwMS.

NO. 11

Hoekstra, T¹, Seves, BL², Hoekstra, F^{2,3}, Brandenburg, P^{2,3}, Kroops, LA², Hettinga, FJ¹, Dekker, R¹, Woude, LHV van der^{2,3}

Sustainability of physical activity and healthcare costs after rehabilitation: the respect study

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4. DEPARTMENT OF SPORT, *Exercise and Rehabilitation, Northumbria University, Newcastle, UK.*

- **PURPOSES** (1) To identify trajectories of physical activity (PA) during and after rehabilitation, and (2) to describe the total healthcare costs per PA trajectory over time.
- **METHODS** People with physical disabilities or chronic diseases (N=1719) were followed from baseline (T0: 3-6 weeks before discharge) to 14 (T1), 33 (T2) and 52 (T3) weeks after discharge from rehabilitation in the Rehabilitation, Sports and Active lifestyle (ReSpAct) study. All participants participated in the Rehabilitation, Sports and Exercise (RSE) programme in Dutch rehabilitation care. Latent Class analysis was conducted to determine trajectories of PA using self-reported data of the Short Questionnaire to Assess Health-enhancing physical activity. Total healthcare costs in euros were determined by the iMTA Medical Consumption Questionnaire. Descriptive statistics were performed to describe healthcare costs per PA trajectory over time.
- **RESULTS** Six trajectories of PA were identified: two large stable trajectories 'semi-active' (N=943) and 'active' (N=188), and four small intermediate trajectories 'recovery' (N=91), 'decline' (N=67), 'strong recovery' (N=21) and 'strong decline' (N=10). Direct costs were generally lower throughout the follow-up for patients in the active trajectory (average €3917 at T0; €715 at T3) compared to patients in the semi-active trajectory (average €5625 at T0; €1507 at T3).
- **DISCUSSION** This study highlights the variation in physical activity behaviour during and after rehabilitation and demonstrates that sustainable physical activity behaviour after rehabilitation treatment seems to coincide with lower healthcare costs. Opportunities for optimisation of active lifestyle promotion during but also after rehabilitation should be investigated.

NO. 10

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"Exercise is Medicine" in Dutch rehabilitation care: the past, present, and future

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6. DEPARTMENT OF SPORT, *Exercise and Rehabilitation, Northumbria University, Newcastle, UK*
7. STICHTING SPECIAL HEROES NEDERLAND, *Arnhem, NL*

- **Integrating** the "Exercise is Medicine" concept in rehabilitation practice is a promising approach to increase physical activity levels among people with physical disabilities or chronic diseases. The Rehabilitation, Sport, and Exercise (RSE) program is an example of an evidence-based program that aligns perfectly with the "Exercise is Medicine" concept. A key component of the RSE program is providing rehabilitation clients with Motivational Interviewing-based physical activity counseling during and after their rehabilitation treatment. In the last decades, several activities have been conducted to implement the RSE program in Dutch rehabilitation practice. This poster provides an historical overview of key activities undertaken to integrate physical activity promotion in Dutch rehabilitation practice.
- **In 2007**, the effectiveness of the RSE program was demonstrated via a randomized controlled trial among >1200 people with physical disabilities. During 2012-2015, the Dutch Ministry provided financial support to implement the RSE program in 18 rehabilitation centers and hospitals across the country. Simultaneously, the Rehabilitation, Sports, and Active lifestyle (ReSpAct) study was established to evaluate the implementation of the program on an organizational (n=18), professional (n>70) and client level (n=1719). During 2018-2022, the follow-up study (ReSpAct 2.0) will gain a better understanding of the heterogeneity in physical activity levels among people with physical disabilities or chronic diseases. These insights will be used to further improve physical activity promotion strategies in rehabilitation care.
- **All activities** have been undertaken by academic-community partnerships between academic researchers and rehabilitation stakeholders, which contributed to the strong scientific foundation of the RSE program. This historical overview of collaborative research activities may inspire other groups in other countries to integrate the "Exercise is Medicine" concept into rehabilitation practice.

NO. 12

Kafkas E¹, Kafkas A¹

Cancer and Exercise

1. IINONU UNIVERSITY, *Faculty of Sport Sciences, Department of Movement and Training Sciences, Malatya, Turkey*

- **More specifically**, physical activity and exercise are associated with reduced risk of some malignancies, with evidence considered convincing for colon cancer, probable for endometrial and post-menopausal breast cancer and limited for lung, and pancreatic cancers. A plethora of research articles suggest that regular exercise decreases the risk of developing different types of cancers (e.g., colon, breast, prostate, endometrial, and lung).
- **This systematic review** summarises the literature on the health effects of exercise during cancer rehabilitation and appraises the methodological thoroughness of researches in this area to date. The thematic studies were identified through a systematic search of Scholar Google, PubMed and Embase to May 2019. In this systematic study, inclusion criteria were: Randomized, randomized controlled, experimental, reviews, and case report investigations aimed at explaining the relationship between cancer and exercise have been identified. Qualitative and descriptive studies were determined as exclusion criteria. A total of 321 articles were obtained by scanning with the identified keywords.
- **These researches** were systematically examined according to their titles and a total of 217 researches in different languages (other than English) were excluded from the scope of the study. At the end of this process, the abstracts and full texts of the remaining 104 studies were examined according to the inclusion and exclusion criteria determined within the scope of the study and 19 articles that were suitable for the study were evaluated (PRISMA compliant).
- **Most interventions** were aerobic or resistance-training exercise programmes, and exercise type, frequency, duration and intensity varied across researches. Improvements in physical functioning, cardio respiratory fitness, strength, physical activity levels, quality of life, fatigue, immune function, haemoglobin concentrations, potential markers of recurrence, and body composition were reported.

NO. 13

Kandiah K^{1, 2}, Mohamed MNA^{1, 2}, Zahari M³**Acute effects of High Intensity Interval Training (HIIT) and Steady State Moderate Intensity Training (SSMIT) on Intraocular Pressure among Sedentary Individuals**

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- Introduction:** Intraocular pressure (IOP) remains the main treatable risk factor for glaucoma, which causes blindness in 4.5 million people worldwide, accounting for slightly more than 12% of all global blindness. Thus, treatment of glaucoma has traditionally been aimed at reducing the IOP, medically or surgically. Exercise is one of the factors that has been proven to influence IOP.
- Purpose:** The purpose of the study was to determine the effect of different types of aerobic exercise (HIIT & SSMIT) on intraocular pressure and determine which type is superior in reducing IOP.
- Methods:** A total of 40 sedentary participants (16 males & 24 females) (age = 33.75 ± 7.15) were recruited amongst the hospital staff of University of Malaya Medical Centre. They were randomised into 2 equal groups. Each group performed both protocols (SSMIT & HIIT) based on a crossover design with a 4 day wash out period between protocols. Participants cycled for 30 minutes at a speed of 60 rpm for each protocol. Participants cycled at a moderate intensity of 50% of their VO₂ reserve (VO₂R) for the SSMIT protocol and total of 10, 3-minute cycles (1-minute-high intensity of 75% VO₂R and 2 minutes low intensity of 35% VO₂R) for the HIIT protocol. The IOP of the right eye was measured using an iCare rebound tonometer TA01i before the exercise, and repeated immediately after (0min), 5, 10, 15, 20 & 30 minutes after the exercise session.
- Results:** Baseline IOP for SSMIT (IOP = 14.43±2.87) and HIIT (IOP = 14.38±2.89). We found that both SSMIT and HIIT reduced IOP. SSMIT reduced IOP up to 20 minutes post exercise but is statistically significant up to 15 minutes post exercise. HIIT reduced IOP up to 30 minutes post exercise but is statistically significant up to 20 minutes post exercise. The magnitude of IOP reduction was more after HIIT protocol compared to SSMIT.
- Conclusion:** We conclude that both SSMIT and HIIT are effective in reducing IOP. When compared, HIIT proved to be superior in terms of both magnitude and length of IOP reduction.

NO. 15

Kouwijzer P^{2,3}, de Groot S^{2,3}, van Leeuwen CMC¹, Valent LJM¹, van Koppenhagen CF⁵, van der Woude LHV^{2,6}, Post MWM^{1,6}**Short-term effects of training for the HandbikeBattle on quality of life**

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- AMSTERDAM REHABILITATION RESEARCH CENTER I READE, Amsterdam, the Netherlands
- REHABILITATION CENTRE DE HOOGSTRAAT AND RUDOLF MAGNUS INSTITUTE FOR NEUROSCIENCE, University Medical Centre Utrecht, the Netherlands
- PHYSICAL MEDICINE AND REHABILITATION IN UNIVERSITY MEDICAL CENTRE, Utrecht, The Netherlands
- UNIVERSITY OF GRONINGEN, University Medical Center Groningen, Center for Rehabilitation, Groningen, the Netherlands

- Introduction:** The HandbikeBattle (HBB) is an annual uphill handcycling race among teams of twelve Dutch rehabilitation centers in Austria. The event was created to promote an active lifestyle among former rehabilitation patients.
- Research questions** 1) Do life satisfaction (LS) and mental health (MH) change during 5 months of training for the HBB and during 4-months follow-up? 2) Are changes in LS and MH associated with change in physical capacity?
- Methods** 102 participants (39.9±12.2 years, 83 men) with spinal cord injury (N=96) or spina bifida (N=6) were included. T1: start of the training period, T2: after the training period, T3: 4 months follow-up. SF-36 mental health index (range 0-100) and LS (range 2-13) questionnaires were filled out. At T1 and T2, a graded handcycle/arm crank peak exercise test was performed. Peak power output (PO_{peak}) and peak oxygen uptake (VO₂peak) were determined. Multilevel regression analyses were used to investigate LS and MH over time and to investigate the associations with physical capacity. Hybrid models differentiated between the cross-sectional association and the longitudinal association.
- Results MH was stable over time (T1):** 77.9±14.7, T2: 78.8±14.0, T3: 75.4±16.4). LS significantly improved during the training period and did not significantly change during follow-up (T1: 8.3±2.2, T2: 8.8±2.3, T3: 8.5±2.4). Physical capacity significantly increased between T1 and T2 (PO_{peak} 122±34W to 144±43W; VO₂peak 1.94±0.53 l/min to 2.09±0.64 l/min). MH and LS both showed no associations with PO_{peak}, but showed a significant cross-sectional association with VO₂peak. There were no significant longitudinal associations.
- Discussion** MH remained stable, whereas LS and physical capacity increased during the training period. There were no significant longitudinal associations. Future studies should focus on other variables explaining the increase in LS, and on long-term effects of training on LS and physical capacity.

NO. 14

Kirsten J¹, Persch H¹, Schulz SVW¹, Wais V², Otto S¹, Bunjes D², Steinacker JM¹**Low aerobic capacity in patients prior to allogeneic stem-cell transplantation is not explained by anemia**

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- UNIT FOR ALLOGENEIC BLOOD STEM CELL AND BONE MARROW TRANSPLANTS, Clinic for Internal Medicine III, Ulm University Medical Center, Ulm, Germany

- Allogeneic hematopoietic** stem cell transplantation (allo-HSCT) often is the only curative treatment option for a variety of hematological diseases and often performed after previous treatment including chemotherapy. Although therapy-associated side effects of HSCT have been successfully reduced by optimized therapy regimes in recent years, morbidity and mortality remains high. Most patients suffer from anemia. The aim of this pilot study was to examine whether anemia found before allo-HSCT is related to the low aerobic capacity reported for HSCT-patients.
- Methods:** 95 patients (m = 59, f = 36, aged 18 - 72 years) were included and underwent cardiopulmonary exercise testing until exertion (cycle ergometer, standardized ramp protocol, start: 25 W, increment: 15W/min). Oxygen uptake (VO₂) was continuously measured breath-by-breath. Hemoglobin was measured in supine, resting conditions from the cubital vein blood. Anemia was defined as for men: Hb < 13 g/dl, females: Hb < 12 g/dl).
- Results:** 63 (m = 38, f = 25) patients reached cardiopulmonary exertion (RER > 1.15), 24 (m = 16, f = 8) Patients reached an RER between 1.0 - 1.15, in 8 Patients RER was lower than 1.0. In the 63 patients reaching exertion, Hb was 9.48 ± 1.53 g/dl, relative maximum VO₂ (rVO₂peak) was 19.63 ± 4.74 ml/min/kg, 45 (m = 31, f = 14) of those patients had a VO₂peak below 90% of age and sex-related normal values, anemia was found in 58 (m = 37, f = 21) patients (92.1 %). There was no significant correlation between Hb and rVO₂peak (m: r = 0.164, f: r = 0.256).
- Conclusion:** In patients before allo-HSCT, rVO₂peak was pathological low in 71% and anemia was found in 92%. From this cross-sectional data, the low aerobic capacity in those patients cannot be attributed to the anemia alone. The low rVO₂peak values may be attributed to a state of myopathy and explained by lower oxygen consumption in the working muscles. Further studies should therefore measure blood volume and hemoglobin mass instead of Hb-concentrations.

NO. 16

Krops LA¹, Van der Heide AD¹, van Hoorn T¹, Zijlstra T¹, Bosman DW¹, Dekker R¹**Meaningful use of Personal Health Record for stimulating active lifestyle change in rehabilitation**

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- Introduction:** The Dutch government aims for nationwide implementation of Personal Health Record (PHR) in 2020, to empower citizens in periods of health and impairment. The Center for Rehabilitation of the University Medical Center Groningen focusses on stimulating sustainable active lifestyle and intends to facilitate a smooth transfer from clinic to home setting. In that perspective, the current project aims to implement PHR in the context of active lifestyle promotion during and after rehabilitation.
- Methods:** Intentions and barriers regarding the use of PHR were investigated, using semi-structured interviews with patients and a focus group discussion with care professionals. A prototype PHR was developed based on these requirements by a private company, and will be pilot-implemented using an iterative development approach.
- Results:** Both patients and professionals corroborated the added value of using PHR, in order to gain insight in individual rehabilitation processes and progress, by also including self-reported data. Barriers included lack of digital skills for both patients and professionals, keeping track of data gathered by multiple patients and sources, dealing with several available PHR solutions, and use of language. The prototype PHR enables data sharing between patients and several professionals (e.g. individual care plan), individual goal setting (e.g. activity goals) and insight in individual progress by diaries and connecting activity trackers. Moreover, a PHR provides opportunities for interaction between patients and professionals, facilitating individual coaching aiming for sustainable lifestyle change during and after rehabilitation.
- Discussion:** Intentions of patients and professionals regarding use of a PHR were positive in general, despite barriers that should be taken into account for pilot-implementation. Autumn 2019, PHR will be pilot-implemented as an assistive tool for individual active lifestyle coaching within routine rehabilitation care.

NO. 17

McMullan I, Blackburn N, Tully MA, Wilson J

Is light physical activity associated with good balance in older community-dwelling adults?

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- › **Physical activity promotion** for older adults often focuses on moderate to vigorous intensity physical activity (PA), but older adults may be more likely to engage in low intensity PA due to functional limitations. The benefits associated with LPA for general health are emerging but the benefits for balance are lacking. Additionally, self-reported measures of physical activity are more commonly used due to ease of implementation and costs. Self-reported measures which are subject to bias which may lead to an underestimation of LPA.
- › **This study examined** the relationship between objectively measured LPA and balance measured using balance items from the Short Physical Performance Battery (SPPB) in an EU wide cohort of older adults (n=1360), recruited as part of the Sitless study. Participants wore ActiGraph wGT3X+ accelerometers for one week and completed side by side stand, semi-tandem, tandem, and chair stand tests. A multiple linear regression, adjusted for socio-demographic characteristics, was calculated to predict balance based on LPA. The mean age of the sample was 75.27 (St. dev=6.29) years; 62% were female, 75% had a secondary education or above, 78% were overweight or obese, 53% were married/ in a stable relationship, 52% were living with a husband/wife or partner; 69% experienced good to excellent health. LPA was found to be a statistically significant independent predictor of side by side stand (r=0.03), semi-tandem stand (r=0.05), full tandem (r=0.09), and chair stand (r=0.11).
- › **These findings suggest** that objectively measured LPA is important for objectively measured balance performance in older adults, providing further evidence of the potential health benefits of LPA for older adults.

NO. 19

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Barriers and facilitators for clinicians to implement Exercises = Medicine

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 2. DEPARTMENT OF REHABILITATION MEDICINE, *University Medical Center Groningen, University of Groningen, The Netherlands.*
 3. INSTITUTE OF SPORTS STUDIES, *Hanze University of Applied Sciences, Groningen, The Netherlands*
 4. 4 CENTER FOR HUMAN MOVEMENT SCIENCES, *University Medical Center Groningen, University of Groningen, Groningen, the Netherlands.*

- › **Introduction** Despite the worldwide effort to stimulate 'exercise is medicine' (E=M), the knowing-doing implementation gap of E=M, still exists at the level of clinicians. This means that although clinicians know that prescribing active lifestyle as a treatment option will result in improved health, they do not frequently provide active lifestyle referral in routine clinical care.
- › **Research question** What are barriers and facilitators for clinicians to implement E=M in routine clinical care?
- › **Methods** The current implementation status of E=M was studied using a mixed method approach. The current provision of tailored E=M prescription was assessed using questionnaires. A subsample of the responding clinicians was invited for a semi-structured interview regarding the facilitators and barriers that they perceive when implementing E=M in their clinical routine.
- › **Results** All clinicians reported to sometimes discuss a physically active lifestyle with their patients, and 60% of the respondents estimated that they discuss a physically active lifestyle in at least 4 out of 10 patients. Barriers that were mentioned included: no time and/or other priorities during a consultation, unmotivated patients and no appropriate referral options. Facilitating factors for implementation of E=M were: evidence for effect of a physically active lifestyle on patients' improved physical and mental health, the reduction of pain and recurrent complaints.
- › **Discussion** Although clinicians report to be aware of health benefits of physical activity, they struggle to implement E=M in practice. Implementation strategies will be developed to enhance the positive impact of facilitators and on the other hand overcome barriers that are both important and changeable. The results of this study will be used for the implementation of an intervention that will be developed to improve E=M prescription in two Dutch university medical centers.

NO. 18

Middelweerd A¹, Mollee JS², Klein MCA², Rajper AM², Brug J³, te Velde SJ⁴

Exploring use and effects of an app-based intervention to promote physical activity: Active2Gether

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 2. VRIJE UNIVERSITEIT AMSTERDAM, *Faculty of Science, Amsterdam, the Netherlands*
 3. RIJKSINSTITUUT VOOR VOLKSGEZONDHEID EN MILIEU, *Bilthoven, the Netherlands*
 4. TE VELDE RESEARCH AND CONSULTANCY, *Bunnik, the Netherlands*

- › **This study explored** the use and short-term effects of an app-based intervention Active2Gether (A2G), that aimed to increase levels of physical activity (PA) of young adults aged 18-30 years (N=104). The participants were allocated to the A2G-Full condition (tailored coaching messages, self-monitoring, social comparison), A2G-Light condition (self-monitoring, social comparison) and the Fitbit-only control condition (self-monitoring).
- › **All participants** received a Fitbit One activity tracker - that could be synchronized with the intervention apps - to monitor PA behavior. A 12-week quasi-experimental trial was conducted to explore intervention effects on weekly moderate-vigorous PA (MVPA) and relevant behavioral determinants (self-efficacy, outcome expectations, social norm, intentions, satisfaction, perceived barriers). The ActiGraph wGT3XBT and GT3X+ were used to assess baseline and post-intervention follow-up PA. Compared to the Fitbit condition, the A2G-Light condition showed the largest effect sizes for minutes of MVPA per day (B= 3.1, 95%CI= -6.7;12.9), and smaller effect sizes were seen for the A2G-Full condition (B= 1.2, 95%CI= -8.7; 11.1). No significant intervention effects on the behavioral determinants at post-intervention follow-up were found for either the A2G-Full nor the A2G-Light condition. The overall engagement with the Fitbit activity tracker was high (median= 88 percent of the days), but this was lower in the Fitbit condition. Participants in the A2G conditions reported more technical problems with the app than participants in the Fitbit condition.
- › **The current study** showed no meaningful or statistically significant differences in MVPA or determinants of MVPA after exposure to the A2G-Full condition as compared to A2G-Light or Fitbit condition. This might partly be explained by the small sample size and the low rates of satisfaction in the participants in the two A2G conditions that might be due to the high rates of technical problems.

NO. 20

Saúdo B¹, de Hoyo M¹, McVeigh J²

Changes in strength and physical function after flywheel resistance exercise training in older adults

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 2. DISCIPLINE OF PHYSIOTHERAPY, *School of Clinical Therapies, College of Medicine and Health, University College Cork, Cork, Ireland.*

- › **Flywheel devices** have emerged as an alternative to gravity dependent weights, allowing participants to produce greater, force, power, and improve muscle mass and neural adaptations, than traditional strength training programs; however, to date, only one study using this exercise paradigm has been completed in older adults.
- › **This study aimed** to assess the effects of flywheel resistance exercise training on muscle strength, muscle power and physical function in community dwelling older adults and to investigate whether changes in strength and power are related to improvements in physical function. Thirty-six participants (64 ± 5 years) were randomly allocated to either a flywheel resistance exercise training group (ETG; n = 18) who underwent 6-weeks of training (2 to 3 days per week on a flywheel squat device-4 sets of 9 maximal repetitions-) or a control group (CON; n = 18). Isokinetic concentric (60°/s and 240°/s) and eccentric (120°/s) knee extension and flexion peak torques and mean power were measured. Physical function was assessed by the 30 second Chair Sit-Stand Test (CST) and walking speed.
- › **After the intervention** within-group analyses showed significantly greater flexion torques and mean power with the dominant leg (concentric at 60°/s and 240°/s and eccentric at 120°/s; all d >0.7, p<0.05) and improvements in CST (d >0.8) in the ETG group, while no substantial differences were found in CON group. Significant between group differences in knee flexion torque both concentric (at 60°/s: η²=0.168 and 240°/s: η²=0.112) and eccentric (at 120°/s: η²=1.03) with the dominant leg were also found in favour of the ETG group. There was also significantly better performance in the CST test for the ETG (η²=0.207). There were significant association between changes in strength and changes in mean power in the ETG. Changes in physical function outcomes were also observed.
- › **In conclusion**, flywheel resistance exercise training is an appropriate form of activity for improving strength and functional capacity of older adults.

NO. 21

Sañudo B, de Hoyo M, Carrasco L

Using wearable technologies to promote physical activity and healthy eating in young adults1. DEPARTMENT OF PHYSICAL EDUCATION AND SPORT, *University of Seville, Seville, Spain*

- ▶ **More than half of young adults** over 18 do not comply with international recommendations of physical activity and it is well documented that physical inactivity is directly involved in the major non-communicable diseases worldwide. Despite these figures, lifestyle-related strategies for improving physical activity and eating outcomes used to be ineffective.
- ▶ **This study aimed** at developing a mobile application (App) that, applying the principles of gamification, had a positive impact on the habits (i.e., physical activity and nutrition) of university students. A group of 13 lecturers from different universities and degrees designed strategies to promote a healthy lifestyle that were implemented in the App in the form of challenges for the students. A total of 16 groups of 3-4 students each participated in the experience. Physical activity (International Questionnaire of Physical Activity –IPAQ-) and nutritional habits (Food Frequency Questionnaire –FFQ-) were assessed and through wearable technologies (Xiaomi MiBand2) the number of steps was recorded and energy expenditure was estimated.
- ▶ **After the 12-weeks intervention**, the number of steps was increased by 41% and the estimated calories by 17%. After a follow-up of 4 weeks, many of the students had improved their habits, which has important consequences for the implementation of future health strategies in this population group.

NO. 23

Beck H¹, Gering F², Lützner J³, Günther K-P⁴, Walther A¹, Stiehler M¹**Physical Abilities in Patients after Kidney Transplant**

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 2. MEDICAL CLINIC 4: NEPHROLOGY AND HYPERTENSION, *University Hospital Erlangen, Germany*
 3. DEPARTMENT OF PEDIATRIC NEPHROLOGY, *Hannover Medical School, Hannover, Germany*
 4. DEPARTMENT OF PSYCHOSOMATICS AND PSYCHOTHERAPY, *Hannover Medical School, Hannover, Germany*

- ▶ **Introduction:** NTX 360° is an interdisciplinary project to improve kidney transplant (NTX) aftercare funded by the national health insurance innovation fund. We describe physical performance of NTX patients at initial assessment before inclusion in a guided training program.
- ▶ **Hypotheses:** Patients after NTX are suspected to be reduced in physical performance.
- ▶ **Methods:** As part of the NTX 360° project, included patients were initially examined. Age, sex, time since NTX, height, and weight were recorded. Physical examination, resting and exercise ECG was performed. Termination of exercise ECG occurred with subjective fatigue, pathological ECG, or blood pressure values. Data are shown as mean ± standard deviation (span if necessary). Gender, weight and size-adapted target performance (1.2) was calculated. Actual performance was compared by T-test to calculated target performance. A p < 0.05 was defined as statistically significant.
- ▶ **Results:** Out of 605 patients, 569 (348 male / 221 female) datasets were complete and analyzed. Age was 51.1 ± 16.3 years. Time from TX was 6.5 ± 5.7 years (0.3–43.2). With a calculated target power of 160 ± 41 watts, patients achieved 112 ± 41 watts (p < 0.0001). Performance in women was lower than in men (89 ± 27 W vs. 127 ± 27 W, p < 0.0001). This corresponds to 70 ± 20% of the calculated target power without a gender-specific difference.
- ▶ **Discussion:** As previously described in smaller cohorts, performance of kidney transplant patients is highly significantly reduced as compared to gender, weight and size-adapted target performance (3). A targeted physical training seems necessary. Effects of such guided training will be examined after completion of the project.

NO. 22

Scheller D¹, Wendt J², Müller-Stierlin A¹, Flechtner Mors M¹, Luszczynska A², Zeeb HF³, Steinacker JM⁴ and the WP⁴ PEN group⁴**Effectiveness of Existing Policies for Lifestyle Interventions – Policy Evaluation Network – WP4 Implementation**

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 2. SWPS UNIVERSITY OF SOCIAL SCIENCES AND HUMANITIES (SWPS), *Poland*
 3. LEIBNIZ INSTITUTE FOR PREVENTION RESEARCH AND EPIDEMIOLOGY – BIPS, *Germany*
 4. WORK PACKAGE 4 (WP4), *Policy Evaluation Network (PEN), JPI "A Healthy Diet for a Healthy Life" - /www.jpi-pen.eu/*

- ▶ **Background:** Non-communicable diseases (NCDs) were responsible for 40.5 million deaths in 2016. 71% of all deaths worldwide, respectively. Physical inactivity and unhealthy diet are two of the key behavioural risk factors. Policy actions to improve health behaviours have the potential to influence health and well-being of an entire population. JPI HDHL's Policy Evaluation Network (PEN) started in May 2018 with the aim to evaluate policy interventions regarding their impact on health behaviours at population level. PEN is a multi-disciplinary research network of 28 research centres from seven European countries and New Zealand, structured around seven inter-related work packages (WPs).
- ▶ **Method:** WP4 will address policy implementation evaluation. Core aspects of implementation processes such as key facilitators and barriers for policies will be identified (month 1-22). Existing data on frameworks will be analysed, leading to a protocol for pan-European assessment of policy implementation evaluation (month 23-36). All PEN WPs are connected through WP6 by three case studies in practice that observe: 1) Sugar taxation 2) Physical activity (PA) with focus on active transport and 3) PA/sedentary behaviour and nutrition policies in schools (month 1-36).
- ▶ **Results:** WP4 is conducting two reviews for the implementation of policies to promote healthy diet and PA: 1) Systematic review on frameworks and 2) Meta-review on barriers and facilitators. By linking WP4 and WP6, knowledge about the implementation of policies in practice can be brought together, contributing to policy success, sustainability and transferability.
- ▶ **Conclusion:** Until April 2021, PEN will provide recommendations to achieve a successful policy implementation on various levels in terms of equity, diversity and future developments. Using the three examples of policy in practice, it will illustrate how to evaluate the implementation and impact of policy in order to deliver the best outcome for a healthy life for European citizens.

NO. 24

Schobert E¹, Schulte-Güstenberg L¹, Konrad C²**Individual App-guided Exercise Therapy in Patients with Depression**

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 2. AGAPLESION DIAKONEKLINIKUM ROTENBURG, *Rotenburg, Germany*

- ▶ **Introduction:** The effects of physical activity in patients with major depression are proven by meta-analyses. However, patients who made positive experiences with exercise in clinical settings hardly keep an active lifestyle at home. The challenge we face is to encourage patients with mental disorders to stay physically active. The Herodikos' application is an innovative method guiding the process of tailoring an individual exercise program and providing it to the patient. Additionally, motivational assets are integrated. However, whether incorporating the app is equivalent or superior to usual care has yet to be investigated.
- ▶ **Hypotheses:** We hypothesize that incorporating an app-guided exercise program will lead to a longer continuation of an active lifestyle (CAL) after discharge from in-patient care compared to usual care.
- ▶ **Methods:** A randomized controlled trial in a cohort of adult patients diagnosed with major depression being treated in in-patient care will be executed in one study center. Patients will be randomized to either the Herodikos' group (HG) or a control group (CG). One investigator will set up the app for the HG patients using questions and functional movement tests provided by the app. Subsequently, patients will receive an individual exercise program, which they can access via the app. Main outcome measures include differences in CAL, depression-related self-assessment and Quality of life. Assessments will take place initially at the diagnostic appointment, after six and after twelve weeks of intervention, respectively. A secondary outcome is the process evaluation.
- ▶ **Discussion:** Management of movement therapy for patients with mental disorders is still insufficient. However, new approaches have to be clinically tested before they may be implemented into standard health care. Data collection and analysis for this study is forthcoming. We hypothesize that patients will show a significantly longer CAL and benefit from using the app.

NO. 25

Schobert E¹, Schulte-Güstenberg L¹, Loo N², Seeber GH³, Lazovic D³, Brinkmann T⁴, Richter A⁴

Individual App-guided Exercise Therapy in Patients with Anterior Knee Pain

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3. UNIVERSITY HOSPITAL FOR ORTHOPEDICS AND TRAUMA SURGERY PIUS-HOSPITAL, *Medical Campus University Oldenburg, Germany*
4. MVZ CHIRURGIE, *St. Johannes-Hospital Varel, Germany*

- › **Introduction:** Patellofemoral Pain Syndrome(PFPS) is an umbrella term used to describe non-specific anterior knee pain resulting from mechanical dysfunction between patella and femur. Optimal management includes evaluation of the patient’s underlying factors followed by performance of a tailored therapy program. The Herodikos’ application is a measure to guide both the diagnostic process and a subsequently specifically tailored exercise program. However, whether the app is superior to a paper-based standard exercise program has yet to be investigated.
- › **Hypotheses:** We hypothesize that individual app-guided exercise therapy will lead to significantly reduced pain levels, improved quality of life and functionality.
- › **Methods:** A RCT in a cohort of adult patients diagnosed with PFPS will be executed in three study centers. Patients will be randomized to either the Herodikos group(HG) or a control group(CG). Two investigators will diagnose the HG patients using a standardized examination protocol and the structured diagnostic guide provided by the app. Subsequently, patients will get an individual exercise program, which they can access via the app over a course of six weeks. Main outcome measures include differences in pain levels(NRS), quality of life(SF36) and subjective functionality(KOOS). Assessments will take place initially at the diagnostic appointment, after 3 and 6 weeks of intervention, respectively. It is also questioned whether patients perceive the app-guided intervention as being beneficial.
- › **Discussion:** Management of anterior knee pain is insufficient. With regard to limited resources, new therapy concepts have to be established to provide individual care. However, new approaches have to be clinically tested before they can be implemented into standard health care. Data collection and analysis for this study is forthcoming. We expect this study to show that patients will significantly benefit from using the app and that they will accept the app-guided therapy.

NO. 27

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Promotion of physical activity for persons with chronic diseases at the interface of health care, sport & leisure

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3. FACULTY OF SPORT SCIENCE, *Eberhard-Karl-University, Tübingen, Germany*
4. FACULTY OF SPORT SCIENCE, *University of Bern, Bern, Switzerland*

- › **The treatment of multimorbidity** has received little attention in health policy, despite being among the most common health problems in industrialised countries. Physical activity (PA) has a positive therapeutic effect on many clinical conditions and is equal or even superior to drug therapy. For this reason PA can be described as a „multipill“. Despite general awareness of the effectiveness of PA, hardly any training interventions for multimorbid patients have been evaluated, neither has PA counselling been implemented in medical practice so far.
- › **There are relevant gaps** in care provision at structural and organisational levels in the treatment and prevention of multimorbidity. MultiPill Exercise should help to close these research gaps and to establish new care structures.
- › **The project** includes a pilot study and a subsequent controlled study. For the pilot study 34 people not fulfilling PA reference and with risk factors or manifest disease signs for at least two of the following diseases: Knee or hip arthrosis, diabetes type 2, overweight/obesity, cardiovascular diseases, are included. The study contains a 12-week systematic training program based on the national PA recommendations for adults. In addition theoretical classes and personal counselling, which are intended to improve the participants’ knowledge of training, nutrition and behavioural change techniques, are included. Following the basic programme, patients are encouraged to maintain the same level of PA. Data of interest are recorded before, after the basic intervention and following the follow-up phase. These include disease-specific and general physiological endpoints. Selected laboratory parameters are collected to demonstrate the effects of PA on inflammation and cartilage metabolism. At all times, adherence/compliance of the target group and feasibility of the intervention are evaluated. The findings of the pilot study will serve as basis for a subsequent controlled study in the health care environment.

NO. 26

Schulz SVW¹, Kirsten J¹, Persch H¹, Wais V², Rau E¹, Otto S¹, Bunjes D², Steinacker JM¹

Leg and grip strength are decreased in patients prior to allogeneic stem-cell transplantation

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- › **Introduction:** In hematological diseases, allogeneic hematopoietic stem cell transplantation (allo-HSCT) is often the only curative treatment option. Despite optimized treatment regimens in recent years, the usually long treatment history with extensive chemotherapy leads to therapy-associated side effects, so that morbidity and mortality are still high. The aim of this pilot study was to investigate the muscle function of patients prior to stem cell transplantation.
- › **Methods:** 94 patients (m = 58, aged 18 - 72 years) were included and grip strength was measured. The results were compared with an age- and gender-adjusted group. In 83 of this patients the maximum force of the knee extensor muscles was examined one-legged with approximately 10 repetitions and one-repetition-maximum was calculated using the Brzycki-formula. The values were put in relation to body weight and compared with a healthy control group of 50 (m = 26, aged 19 - 63 years) subjects.
- › **Results:** The grip strength of the HSCT-patients was 43.7 (16.2 - 70.1) kg for men and 26.6 (17.9 - 42.3) kg for women. In 37 of 58 (63.8%) men were below the 50th centiles, 7 (12.1%) did not reach the 10th centiles. In 18 of 36 (50.0%) women grip strength was below the 50th centiles, one (2.8%) did not reach the 10th centiles. The strength of the knee extensor in HSCT-patients was 30.7 (15.0 - 70.9) kg for men and 20.0 (6.2 - 48.0) kg for women. In the healthy group the men reached 70.0 (45.0 - 100.0) kg and the women 40.0 (25.0 - 60.0) kg. None of the HSCT-patients reached the 50th centiles of the control group, 50 of 52 (96.2%) men and 26 of 31 (83.9%) women were below the 10th centiles.
- › **Conclusion:** In patients before allo-HSCT the knee extensor is more affected by muscle atrophy than grip strength. With a deficit in the knee extensors musculature, many activities of daily life are strongly influenced and independent living is endangered. Further studies should examine whether this weakness can be influenced by exercises.

NO. 28

Bouma S¹, van den Akker-Scheek I¹, Diercks R¹, van der Woude L², Stevens M¹

Development and Evaluation of a Program for applying lifestyle medicine in osteoARthritis (DEPART): study protocol

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2. UNIVERSITY OF GRONINGEN, *University Medical Center Groningen, Center for Human Movement Sciences, Groningen, the Netherlands*

- › **Introduction:** Worldwide, an increase has been observed in the prevalence of lifestyle-related diseases, including osteoarthritis (OA). OA is a degenerative joint disorder, leading to significant disability in daily life. Substantial evidence has demonstrated the positive effects of lifestyle modifications (e.g. increasing physical activity levels and healthy nutrition) in terms of reduced pain and improved physical functioning. However, these effects are currently insufficiently transferred from research settings to daily life and therefore not sustained in the long-term. Health care professionals (HCPs) play an important role in patients’ lifestyle behavior. However, while barriers for adhering to lifestyle interventions at the patient-level are well-known, limited research has been conducted focusing on the role of primary and secondary HCPs and the implementation of lifestyle interventions in their daily acting.
- › **Aim:** To improve the implementation of lifestyle interventions as treatment for OA by HCPs in both primary and secondary care.
- › **Methods:** The DEPART-study consists of three consecutive subprojects. (1) A needs assessment that will be conducted among primary and secondary HCPs which aims to identify barriers and facilitators for implementing lifestyle interventions. This needs assessment will be performed by means of a literature review, qualitative (focus group discussions) and quantitative (survey) research and will be guided by the Tailored Implementation for Chronic Diseases checklist. (2) Program development: using Intervention Mapping, a program targeting the factors identified in the needs assessment will be developed which aims to support HCPs in applying lifestyle interventions. (3) Program evaluation: the developed program will be pilot-tested regarding feasibility in daily clinical practice.
- › **Implications:** Successfully applying lifestyle interventions as treatment for OA is expected to improve quality of life of patients with OA and in the long-term to reduce the demand for (revision) total joint replacement surgery. Therefore, the outcomes of this project are assumed to unload and reduce the costs of orthopedic care. Furthermore, the developed program might serve as blueprint which can be applied in the prevention and treatment of other lifestyle-related diseases.

NO. 29

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Sustainability of physical activity and health-related quality of life after rehabilitation: the respect study

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- BACKGROUND** Sustainable physical activity (PA) and health-related quality of life (HR-QoL) are two key goals in today's rehabilitation practice. Therefore, rehabilitation programs to promote PA need to be evaluated on sustainability of these outcomes after rehabilitation.
- PURPOSES** To identify PA and HR-QoL trajectories after rehabilitation and to determine the association between those trajectories.
- METHODS** People with a physical disability/chronic disease (N=1719) were followed from 3-6 weeks before discharge (T0) to 14 (T1), 33 (T2) and 52 (T3) weeks after rehabilitation in the Rehabilitation, Sports and Active lifestyle study. They participated in the Rehabilitation, Sports and Exercise (RSE) program in Dutch rehabilitation care. Latent Class analysis was used to identify PA and HR-QoL trajectories, based on questionnaire data. A Chi-squared test was performed to determine the association between PA and HR-QoL trajectories.
- RESULTS** Six PA trajectories were identified: two large stable trajectories 'semi-active' (N=943) and 'active' (N=188), and four small intermediate trajectories 'recovery' (N=91), 'decline' (N=67), 'strong recovery' (N=21) and 'strong decline' (N=10). Five HR-QoL trajectories were identified: two large stable trajectories 'moderate' (N=617) and 'high' (N=394), two small intermediate trajectories 'recovery' (N=56) and 'decline' (N=31), and one two-person trajectory 'strong recovery'. The two large and stable PA and HR-QoL trajectories are significantly associated ($\chi^2=33.5(1)$, $p<.001$, $\phi_c=.20$). Of our sample, 55% (N=479) followed both the semi-active and the moderate HR-QoL trajectory, and 10% (N=83) followed both the active and the high HR-QoL trajectory.
- CONCLUSIONS** Most people obtained a semi-active trajectory, but a moderate HR-QoL trajectory after the RSE program, which might suggest optimization of the program to reach sustainable and high levels of PA and HR-QoL after rehabilitation. PA and HR-QoL trajectories are longitudinally associated.

NO. 31

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Exercise training benefits in pediatric oncology: Results from the randomized controlled MUCKI-trial

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- Disease- and treatment-related reductions** of muscular and aerobic performance have been observed in childhood cancer patients. In adult cancer patients, specific exercise training revealed positive effects on muscular and aerobic capacity which were associated with benefits on fatigue and quality of life. Within the "Effects of Combined Resistance and Endurance Training in Pediatric Cancer Patients During Intensive Treatment Phase (MUCKI)-trial" training effects on muscular and walking performance were evaluated.
- In this stratified**, randomized, controlled trial, childhood cancer patients aged between 4 and 18 years were enrolled during intensive cancer treatment phase (ICT). Individuals within the exercise group (EG) participated in supervised exercise training. Training was focused on child adapted playful, moderate intense resistance and endurance exercises and took place 3 to 5 times weekly over a period of 6 to 8 weeks. Individuals of the control group (CG) received usual care. Pre- and post-intervention handheld dynamometry testing for knee flexor strength and six minute-walk test were performed.
- In total** 16 patients in the EG and 17 in the CG completed the study. Group-time-interactions on muscular and walking performance were evaluated by analysis of covariance adjusting for baseline values and stratification factors. Subsequent results revealed favoring effects for EG in knee flexor strength ($F(1,20) = 5.733$; $p = 0.027$; $\eta^2 p = 0.223$) and walking performance ($F(1,25) = 4.270$; $p = 0.049$; $\eta^2 p = 0.146$). Compliance to the training was rated very good to good, no severe adverse events occurred.
- The present results** provide further evidence for beneficial effects from adapted exercise programs in childhood cancer patients suffering from different tumor entities. Adapted pediatric exercise programs are getting attention only recently. In this context, the present findings support further elaboration and implementation of adapted exercise offers in pediatric oncology.

NO. 30

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Who benefits the most? Results of a 6 month endurance training on work ability in middle-aged sedentary women

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- Introduction** Work ability is defined as the balance between individual resources and the specific demands of work task. German employees between the ages of 45 and 65 have significantly more inability work days than younger workers. Moreover female workers have more frequent and longer days of illness than men. The increasing number of intervention studies at the workplace shows the current relevance for measures to increase or maintain ability to work. But who benefits the most of workplace interventions needs to be established.
- Hypotheses** Individualized moderate endurance training partly performed at the workplace improves work ability. To test this hypothesis we conducted a prospective and randomized-controlled study investigating the effects of 6 months exercise on work ability in sedentary women working at a university hospital.
- Methods** We randomized 265 healthy sedentary, middle-aged women to 6 months endurance training (EG, 210 min/week) or a wait-list-control (CG). At baseline and follow-up, we assessed work ability (work ability index [WAI]), physical activity and peak oxygen uptake. In order to examine the influence of baseline work ability, participants were divided into a poor-moderate (WAI 1, n=83), a good (WAI 2, n=136) and an excellent WAI group (WAI 3, n=46).
- Results** Cardiorespiratory fitness improved significantly after 6 months in the EG but not in the CG. The WAI total score increased significantly in the EG (38.3±5.0, 39.8±4.9) but not in the CG (39.4±4.7, 39.3±4.9) with a significant difference between groups. In the EG only the poor-moderate group (WAI1) increased the WAI total score significantly (+3.6±4.7) compared to the good and excellent groups, WAI2 (+0.2±3.2) and WAI3 (+0.1±1.7).
- Discussion** A 6-month individualized moderate endurance training partly performed at workplace during working hours improves work ability in middle-aged women. Employees with a low baseline work ability seem to particular benefit from the intervention which implicates to classify individuals according to the work ability before starting an intervention.

NO. 32

Neu MA¹, Stüssel S¹, Wingerter A¹, Schulz A², Henninger N¹, Merzenich H³, Blettner M⁴, Pfeiffer N¹, Münzel T^{5,6}, Prochaska JH^{2,6,7,8}, Wild P^{2,6,7,8}, Schneider A³, Faber J¹

Associated factors to reduced physical activity in long-term childhood cancer survivors in Germany

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- Based on** the "Cardiac and vascular late sequelae in long-term survivors of childhood cancer (CVS-S)-study", the physical activity (PA) level in German childhood cancer survivors (CCS) was evaluated in relation to tumor entity and compared to the general population. In this cross-sectional study, 1002 CCS diagnosed with neoplasia prior to 15 years of age between 1980 and 1990 were recruited. Level of PA was determined by questionnaire. An activity score (AS) was then calculated based on reported intensity and time of PA and compared to the population-based Gutenberg Health Study (GHS) cohort. Participants were 23 to 50 years old.
- In total**, physical activity questionnaire data was available from 951 CCS and compared to data from 5497 GHS participants. After adjusting for sex and age results from multiple linear regression model revealed that AS was 24% lower in CCS than in GHS participants (-0.24 (95% CI -0.32 to -0.15); $p<0.0001$). With regard to tumor entity AS was lower in CCS from leukemia (-0.18 (95% CI -0.29 to -0.07); $p=0.0012$), central nervous system tumor (-0.39 (95% CI -0.57 to -0.20), $p=0.0001$), renal tumor (-0.27 (95% CI -0.50 to -0.043); $p=0.020$), soft tissue sarcoma (-0.34 (95% CI -0.58 to -0.10); $p=0.0052$) and malignant bone tumor (-0.54 (95% CI -0.81 to -0.26); $p=0.00014$) compared to GHS participants. However, in CCS from lymphoma, neuroblastoma and germ cell tumor there was no significant difference in AS compared to GHS participants. Furthermore, among CCS no association of AS was found in relation to chemotherapy, radiotherapy, recurrence rate and age at diagnosis. In the present study reduced PA level in German CCS was associated to tumor entity. Based on these findings future investigations should explore potential benefits of adapted exercise programs on PA behavior and associated physical and mental wellbeing.

NO. 33

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Large variability in Advice for Return to Physical Activity after Total Knee Arthroplasty in the Netherlands

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- **Introduction** Recommendations concerning return to physical activities (PA) after total knee arthroplasty (TKA) are diverse. The reason might be that the recommendations are often based on expert opinion of health care professionals, as scientific evidence is limited. Return to PA is important as it improves the quality of life of patients, but a quick return to PA may also be associated with risks. We aimed to evaluate the current recommendations to patients after TKA with regard to return to PA provided by Dutch health care professions and hospitals.
- **Methods** Recommendations of 12 Dutch hospitals that perform TKA operations were identified. Recommendations were retrieved using websites, brochures, flyers and content from mobile phone applications. We summarized current recommendations regarding return to PA after TKA surgery, and compared the duration of return to PA as advised by different hospitals.
- **Results** In total, recommendations for 10 activities were summarized. Recommendations regarding return to PA were often missing and varied greatly between Dutch hospitals especially regarding low- and high-impact sports. For example, the advice for resuming cycling varied from 4 to 12 weeks after surgery, recommendations for resuming swimming varied from 6 to 12 weeks after surgery, and advice regarding jogging was only provided by 4 out of 12 hospitals.
- **Discussion** Recommendations for return to PA after TKA are often lacking in usual care and vary considerably between Dutch hospitals. These findings imply that consensus about recommendations for postoperative return to PA are needed to inform patients more uniformly about the effect of TKA on the return to PA.

NO. 35

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Functional electrical stimulation cycling exercise in spinal cord injury: A systematic review

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- **Objective:** To identify and synthesise studies evaluating the effect of functional electrical stimulation (FES) cycling exercise on fitness, health and/or well-being of adults with spinal cord injury (SCI), in order to inform the development of evidence-based clinical practice guidelines.
- **Methods:** Electronic databases were searched up to June 2018 to identify FES cycling exercise intervention studies including adults with SCI. Two independent reviewers conducted study eligibility screening, data extraction and quality appraisal using Cochrane's Risk of Bias tools or Downs and Black scores. Each study was designated as a Level 1, 2, 3 or 4 study, dependent on design and quality appraisal scores (e.g. Level 1 = RCT with Low Risk of Bias; Level 4 = case series with Downs and Black score of 12). We assessed certainty of the body of evidence for each outcome using GRADE confidence ratings (High, Moderate, Low or Very low).
- **Results:** Seventy-nine studies met the eligibility criteria. These included outcomes of muscle volume (31 studies), power output (30 studies), aerobic fitness (24 studies), bone health (21 studies), cardiovascular and metabolic factors (16 studies), muscle strength (13 studies), or other outcomes (<10 studies). For muscle volume, 26 out of the 31 available Level 1-4 studies demonstrated significant improvements (GRADE rating: High). Significant improvements were also found in nearly all studies on lower-body power output (29 out of 30 Level 3-4 studies) and aerobic fitness (19 out of 24 Level 3-4 studies), with GRADE ratings being downgraded to Low due to the lack of Level 1-2 studies.
- **Conclusion:** Current evidence lends support to a strong recommendation for the use of FES cycling exercise to increase muscle volume of adults with SCI, and a conditional recommendation for improving lower-body power output and aerobic fitness.

NO. 34

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Positive effects of exergaming for people with dementia: results of a randomized controlled trial

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- **Being physically active** is advantageous for all. However, people living with dementia (PwD) may experience difficulties because of orientation issues and risk of falls. This may be overcome with the help of exergaming ("physical exercise interactively combined with cognitive stimulation in a gaming environment"). In this study, we evaluate the (cost-)effectiveness of exergaming compared to regular activities in day-care centres (DC's) among PwD and informal caregivers (IC). We also investigate facilitators and barriers to implementation of exergames for this target group.
- **A cluster Randomized Controlled Trial** and a process evaluation. PwD and IC were interviewed at baseline, at 3 and 6 months. Mobility and physical activities of PwD were primary outcomes (also used in the economic evaluation). Secondary outcomes were physical, cognitive, social and emotional functioning, and quality of life for both PwD and IC. Additionally for IC: subjective burden and positive care experiences. We conducted mixed model analyses. Thematic analysis was performed on data from online surveys, qualitative interviews and focus groups for the process evaluation.
- **Twenty DC's** (11 exp. 9 control) in the Netherlands and 112 dyads (PwD/IC: 73 exp. 39 control) participated in the study. According to preliminary results, exergaming was beneficial for memory and social behaviour of PwD and feelings of competence of IC. Cost-effectiveness analyses showed that on average exergaming was more effective and more expensive than usual care. Participants, family and staff highly appreciated exergaming. Facilitators for successful implementation were a.o. finances, easy accessibility of equipment, and support from management and colleagues.
- **This contributes** to the evidence base of innovative physical exercise activities for people living with dementia. PwD will be enabled and motivated to be more physically active due to safe opportunities for enjoyable exercise interventions and insight into its benefits.

NO. 36

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Linking implementation barriers to strategies to support prescription of E=M by clinicians

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- **Introduction:** Several barriers hinder clinicians to prescribe exercise to their patients, such as lack of time, knowledge or support. As a result, 'exercise is medicine' (E=M) is not systematically implemented in general routine hospital care. Therefore, the aim of this study was to link evidence-based implementation strategies to barriers identified by clinicians in order to develop an implementation plan for E=M prescription.
- **Research question:** How can barriers experienced by clinicians for implementing E=M in routine care be addressed by evidence-based implementation strategies?
- **Methods:** We followed a systematic approach using strong stakeholders participation to match implementation strategies to barriers identified during interviews with clinicians working at two university hospitals in the Netherlands. We used available theory and evidence-informed strategies from the Taxonomy of Behaviour Change Methods from Kok et al. 2016 and the Effective Practice and Organisation of Care taxonomy from Powell et al. 2015.
- **Results:** For each barrier we defined what needed to be changed (e.g. knowledge, beliefs, structures, policy agendas). Next, we identified strategies on how to change these barriers (e.g. active learning, audit and feedback, technical assistance, peer education). Parallel, we conducted an interactive session with stakeholders to obtain a list of potential practical activities to support implementation of E=M, such as training for clinicians, insight into possible exercise options within the area, and role models for clinicians. Next, we matched the implementation strategies to the practical activities.
- **Discussion:** Operationalization of strategies into activities, tools, practical applications and materials led to the development of an implementation plan tailored to the specific clinical context. The implementation plan will be used to support implementation of E=M during a pilot study in four departments of university hospitals in the Netherlands.

NO. 37

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Healthy active ageing : the effects of physical activity and exercise on sleep in older adults

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- › **Ageing** is associated with negative changes in sleep quantity and quality. Research reports more bed time but less total sleep time, while slow wave sleep decreases and early-morning awakenings increase. Moreover, sleep becomes less efficient and more disrupted. This lowered sleep quantity and quality affects general functioning, cognitive performance, quality of life and causes fatigue and daytime sleepiness. There is also increasing evidence illustrating the negative consequences of insufficient sleep on the prevalence of cardiovascular disease, metabolic syndrome, diabetes type 2 and obesity. Treatment options for sleep problems include pharmaceutical and non-pharmaceutical strategies. Pharmaceutical treatments have side effects, are expensive and not recommended for long-term use. Exercise could constitute an inexpensive, accessible and simple means of improving sleep. However, the effects on sleep in generally healthy older adults have not yet been reviewed.
- › **This study** therefore reviewed the effects of physical activity and exercise on sleep in older adults. Searches were performed in PubMed, Embase, Web of Science, SPORTDiscus, PEDro, CINAHL, using thesaurus and free terms for physical activity, exercise, sleep and ageing. Studies examining the effects of physical activity and exercise on different aspects of sleep in generally healthy adults aged 60+ years were included. Only 15 studies were found eligible. Physical activity and exercise, if performed regularly, may promote relaxation and raise energy consumption in a way that is beneficial to initiating and maintaining sleep. It improves overall sleep quality and habitual sleep efficiency and it decreases sleep latency and sleep disturbances in older adults. Moreover, slow wave sleep, NREM sleep and wake time after sleep tend to improve. Therefore, in order to encourage healthy ageing, it is critical to focus on physical activity and exercise in older adults to improve sleep and prevent sleep impairments.

NO. 38

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Join the Healthy Boat: A kindergarten and primary school-based health promotion intervention in Germany

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"Join the Healthy Boat" is funded by the Baden-Württemberg Stiftung, Stuttgart, State of Baden-Württemberg, Germany

- › **Introduction:** Inactivity and an unhealthy diet amongst others have led to an increased prevalence of overweight and obesity even in young children. Since most health behaviours develop during childhood health promotion has to start early. The settings kindergarten and primary school have been shown as ideal for such interventions. "Join the Healthy Boat" is a kindergarten and primary school-based health promotion programme focussing on increased physical activity, reduced screen media use and sugar-sweetened beverages, as well as a higher fruit and vegetable intake.
- › **Methods:** "Join the Healthy Boat" started in 2009 as a state policy programme. It is evaluated via a prospective, stratified, cluster-randomized, and longitudinal study with two groups (intervention vs. control group). Intervention and materials were developed using a setting-based approach. The programme is distributed using a train-the-trainer concept. The effectiveness of this intervention is examined in 62 kindergartens and 86 primary schools using standardised protocols, materials, and tools for outcome and process evaluation.
- › **Results:** The programme is currently implemented in 1081 kindergartens and 1054 primary schools. 1930 kindergarten teachers and 3509 primary school teachers participate in the programme and therefore reach approximately 27000 kindergarten children and their parents as well as ca. 85000 primary school children and their parents.
- › **Conclusions:** "Join the Healthy Boat" is one of the largest structured and setting-based health promotion programmes for kindergarten and primary school children in Europe. Results of the evaluation study give a better understanding of health behaviours in early childhood in order to identify strategies for effective health promotion. A nationwide implementation of this programme could empower young children to a healthy lifestyle.