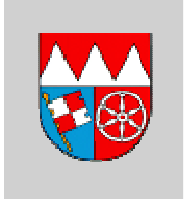


EndoPRIME - Prehabilitation and exercise before arthroplasty

Over the last two decades the number of total joint replacement surgeries increased consistently. With the patient population growing older and therefore suffering from more comorbidities and total joint replacement being progressively indicated even in patients with compromised medical status, the need for preoperative optimization of medical conditions appears a promising approach to reduce perioperative risk for complication, and readmission rates, avoid prolonged functional deficiency and improve functional, objective as well as patient reported, subjective outcome following surgery. Literature addressing the question of preoperative status afflicting postoperative outcome after total joint replacement is still imprecise and inconsistent. There seems to be some data, that a worse preoperative functional status predicts worse outcome in terms of both function and pain after total joint replacement. It is still not clear, what preoperatively evaluable parameters can be modified by which kind of intervention and which measures are suitable to monitor improvement of the outcome following such interventions. Based on the hypothesis that patient reported outcome, the frequency of untoward events and functional outcome following total joint replacement can be improved by establishing an individualized concept aiming at improving medical conditions and physical performance preoperatively, the EndoPRIME Trial (ENDOprosthetic joint replacement - improving treatment by integrating Prehabilitation, Rehabilitation, Individualized Management and Education) was initiated. The trial was approved by the competent ethics committee at Wuerzburg University. The project aims at expanding current knowledge about the feasibility and potential of preoperative improvement and quantify respective effects on postoperative outcome after total joint replacement, The proposed study is an interventional, prospective, single-center pilot study with exploratory data analysis to evaluate the feasibility and potential of improving peri- and postoperative outcome in total joint replacement of the hip, knee and shoulder by a standardized, individually optimized

treatment pathway including pre- and postoperative exercising, risk management and patient education based on a comprehensive preoperative functional assessment and expanded clinical evaluation. Study duration for each individual patient comprises 12 weeks prior to surgery and one year after surgery, i.e. individual participation will last weeks. The primary endpoint of the trial is intraindividual development of osteoarthritis-associated health-limitations as measured by the WOMAC-Score. Further objectives include Patient Reported Outcome measures, type and frequency of perioperative untoward events, and a wide range of clinical and technical assessments of physical performance. Results can be expected by the third quarter 2017.

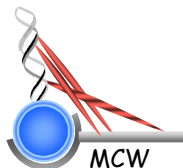


EndoPRIME

-

Prehabilitation and Exercise before Arthroplasty

Lothar Seefried
Nicole Luksche
Michael Schneider
Franca Genest





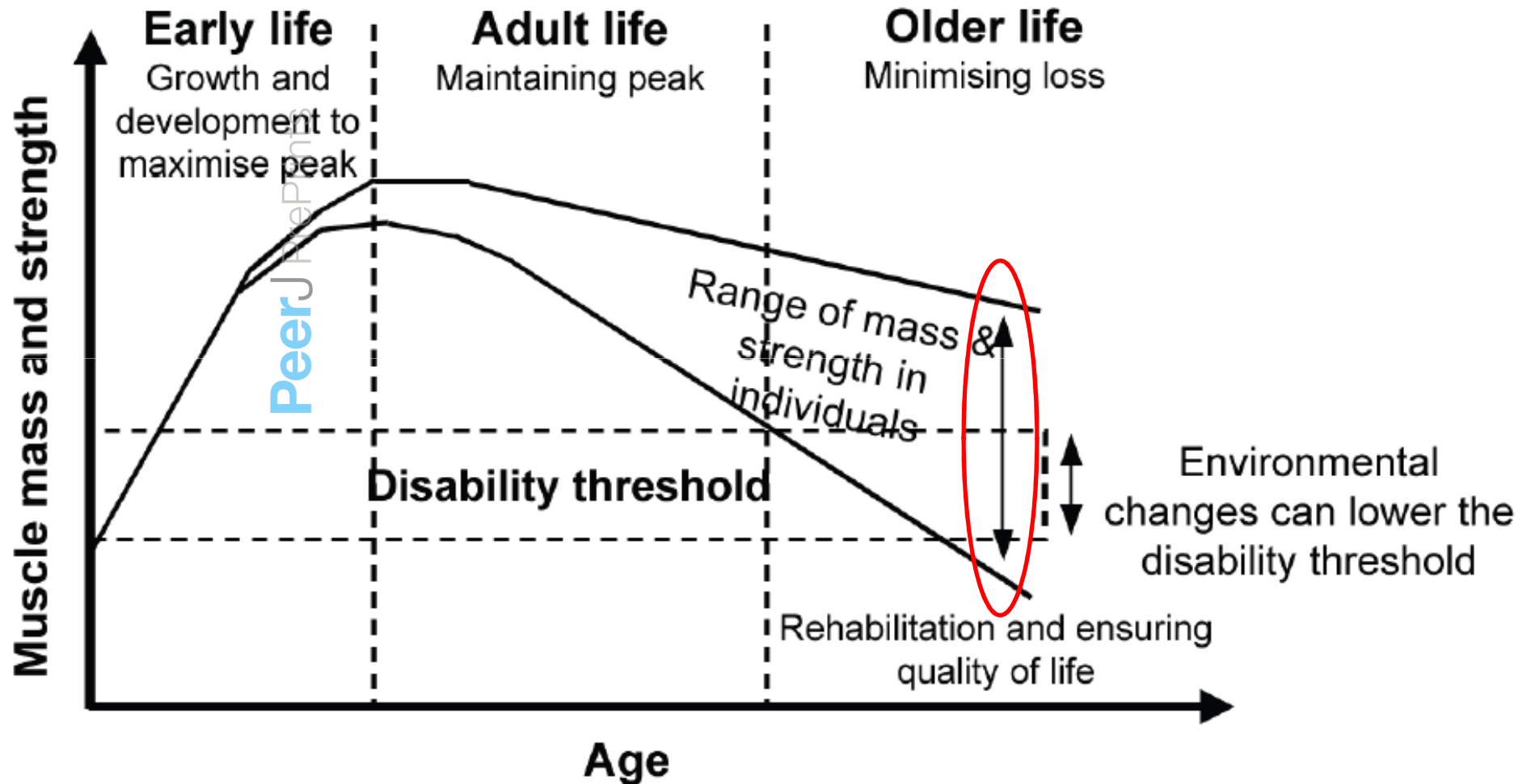
■ ARTHROPLASTY

Athletic activity after lower limb arthroplasty

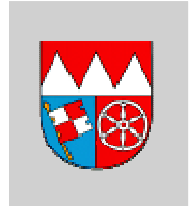
A SYSTEMATIC REVIEW OF CURRENT EVIDENCE

Following joint replacement, participation in sporting activity is common principally determined by pre-operative patient activity levels, BMI and patient age. The type of joint replaced is of less significance. Total time spent performing activity does not change but tends to be at a lower intensity. There is little evidence in the literature of an association between high activity levels and early implant failure.

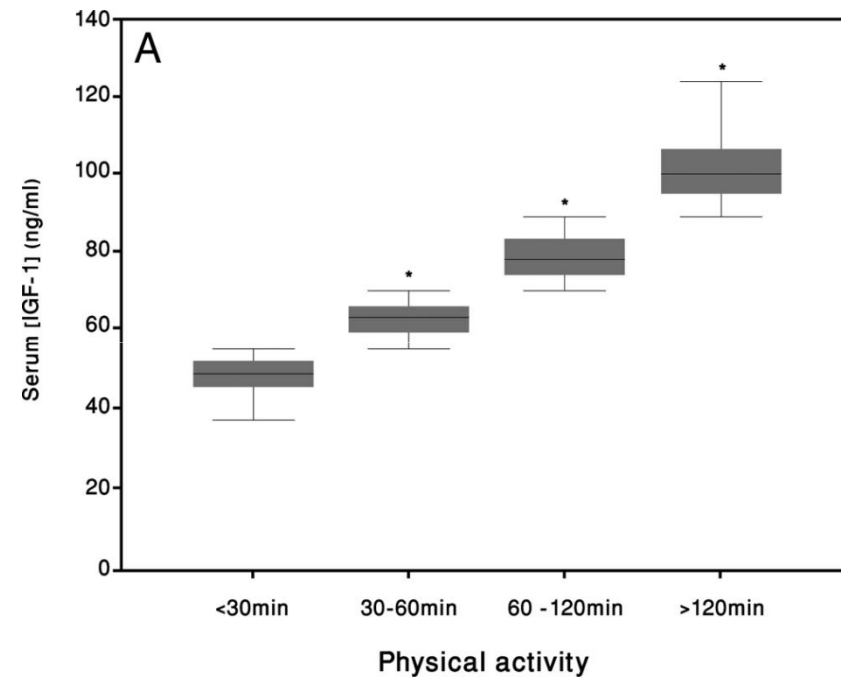
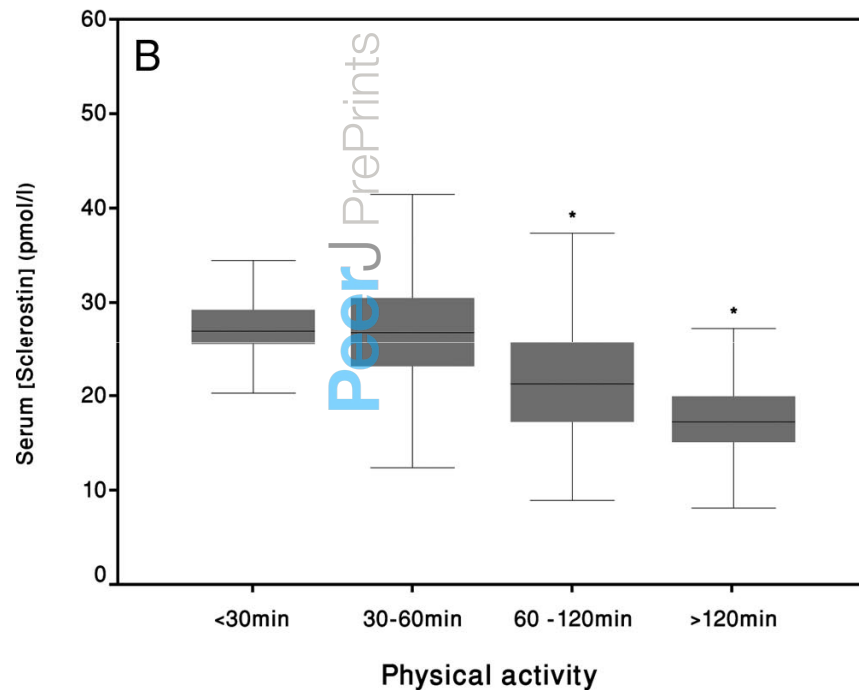
Life course model of Sarcopenia



Sayer, J Nutr Health Aging. 2008



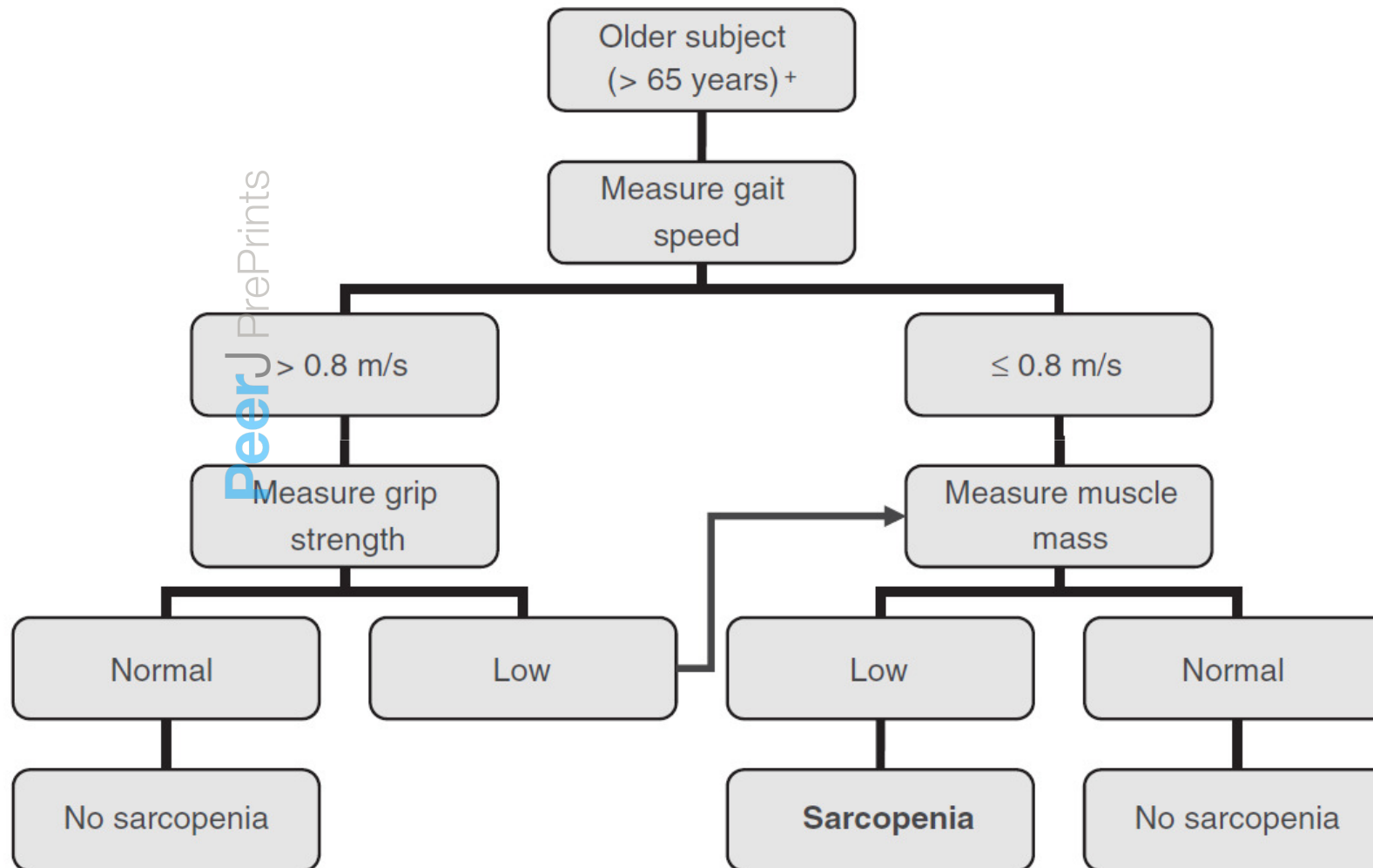
Cross-sectional study with 1235 premenopausal women



Exercise influences Sclerostin level

- 1) Ardawi MS1, Rouzi AA, Qari MH. Physical activity in relation to serum sclerostin, insulin-like growth factor-1, and bone turnover markers in healthy premenopausal women: a cross-sectional and a longitudinal study. *J Clin Endocrinol Metab.* 2012 Oct;97(10):3691-9

Sarcopenia



* Comorbidity and individual circumstances that may explain each finding must be considered

+ This algorithm can also be applied to younger individuals at risk

Cruz-Jentoft et al, Age Ageing, 2010

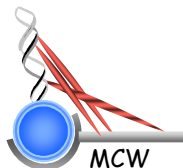
Frailty

Frailty is considered if at least 3 of the following symptoms apply:



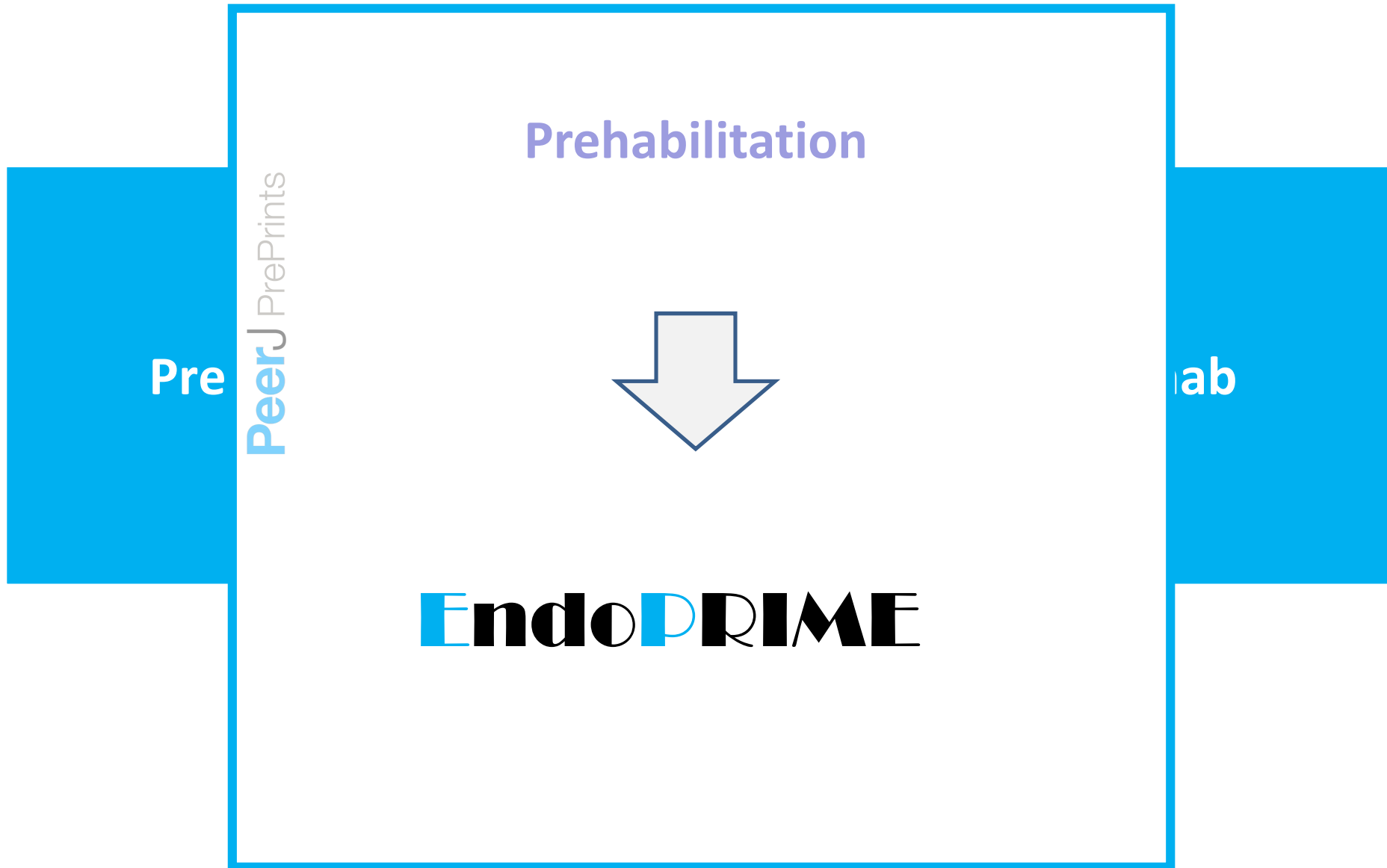
- Reduced Gait Speed
- Weight loss
- Reduced Grip Strength
- Reduced Physical Activity
- Mental Exhaustion

... and in some case limited ability to care for themselves



Prehabilitation





Clinical Trial Protocol

PeerJ PrePrints

ENDOprosthetic joint replacement

—

Improving treatment by integrating
Prehabilitation, Rehabilitation, Individualized
Management and Education

EndoPRIME

Precise Analysis of current medical and musculoskeletal condition

Clinical Examination

Lab Results

Muscle Function

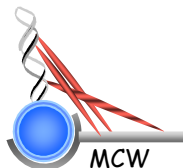
Constitutional Analysis

Bone Metabolism

Pulmonary Function

Assessment of daily activities

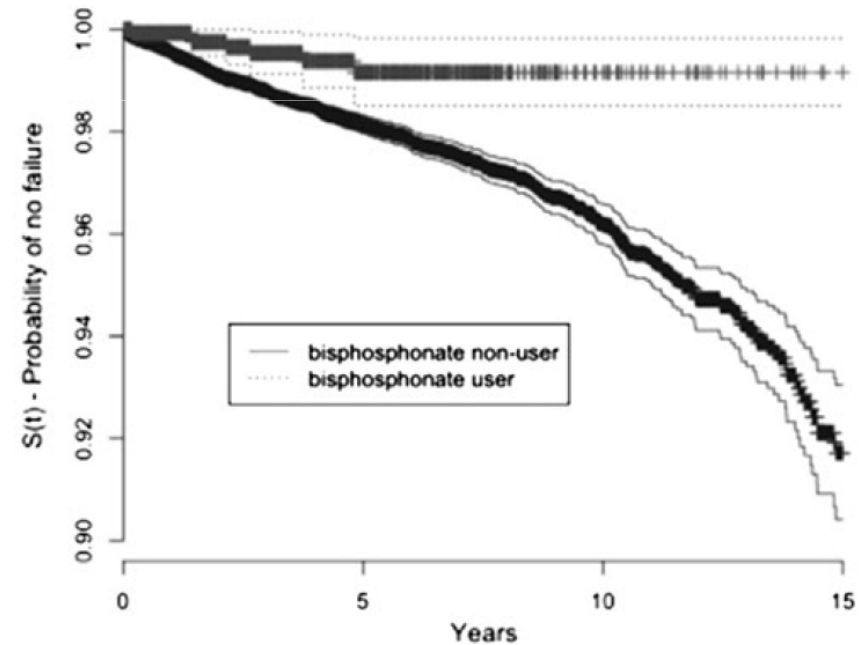
...





- **Blood Tests**
- **Osteodensitometry**
- **Individual fracture risk**
- **Prosthesis survival**

Relevance of Osteoporosis-Treatment for Arthroplasty-Survival



- 1) Prieto-Alhambra D, Lalmohamed A, Abrahamsen B, Arden NK, de Boer A, Vestergaard P, de Vries F. Oral bisphosphonate use and total knee/hip implant survival: validation of results in an external population-based cohort. *Arthritis Rheumatol.* 2014 Nov;66(11):3233-40.
- 2) Russell LA. Osteoporosis and orthopedic surgery: effect of bone health on total joint arthroplasty outcome. *Curr Rheumatol Rep.* 2013 Nov;15(11):371.

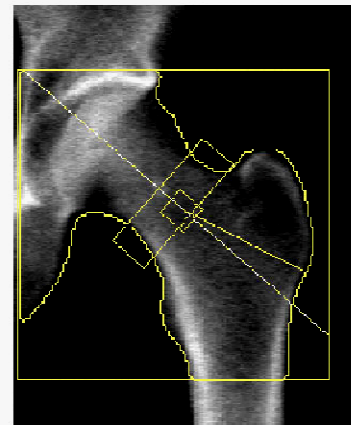
➤ Bone Mineral Density

➤ Lean Body Mass

➤ Fat Mass

➤ Bio-Impedance-Analysis (BIA)

PeerJ Preprints



k = 1.136, d0 = 47.2
112 x 111
NECK: 49 x 15

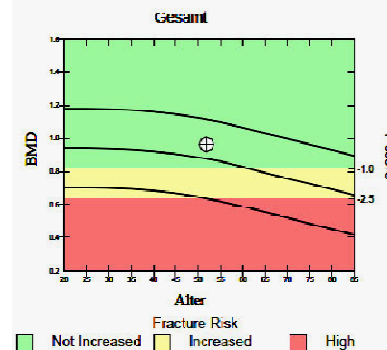
Messungsinformationen:

Scandatum: 28 Februar 2008 ID: A02280809
Scantyp: f Linke Hüfte
Analyse: 28 Februar 2008 12:43 Version 12.7.3
Hütte
Bediener:
Modell: QDR Arbeitsstation (SN 8000)
Kommentar:

DXA-Ergebniszusammenfassung:

Bereich	Fläche (cm ²)	BMC (g)	BMD (g/cm ³)	T-Score	SR (%)	Z-Score	AÜ (%)
Neck	5.45	5.05	0.927	0.7	109	1.6	123
Troch	12.25	8.64	0.705	0.0	100	0.6	109
Inter	21.94	24.50	1.117	0.1	102	0.5	107
Gesamt	39.64	38.19	0.963	0.2	102	0.7	110

GesamtBMD CV 1.0%, ACF = 1.025, BCF = 1.036, TH = 5.028
WHO-Klassifizierung: Normal
Frakturrisiko: Nicht erhöht



Kommentar des Arztes:

- 1) Annemarie Koster et al. Association of fitness with changes in body composition and muscle strength. J Am Geriatr Soc. 2010 February ; 58(2): 219–226.
- 2) Bret H. Goodpaster, The Loss of Skeletal Muscle Strength, Mass, and Quality in Older Adults: The Health, Aging and Body Composition Study. Journal of Gerontology 2006, Vol. 61A, No. 10, 1059–1064.



PeerJ PrePrints
Individually arranged
Training schedule

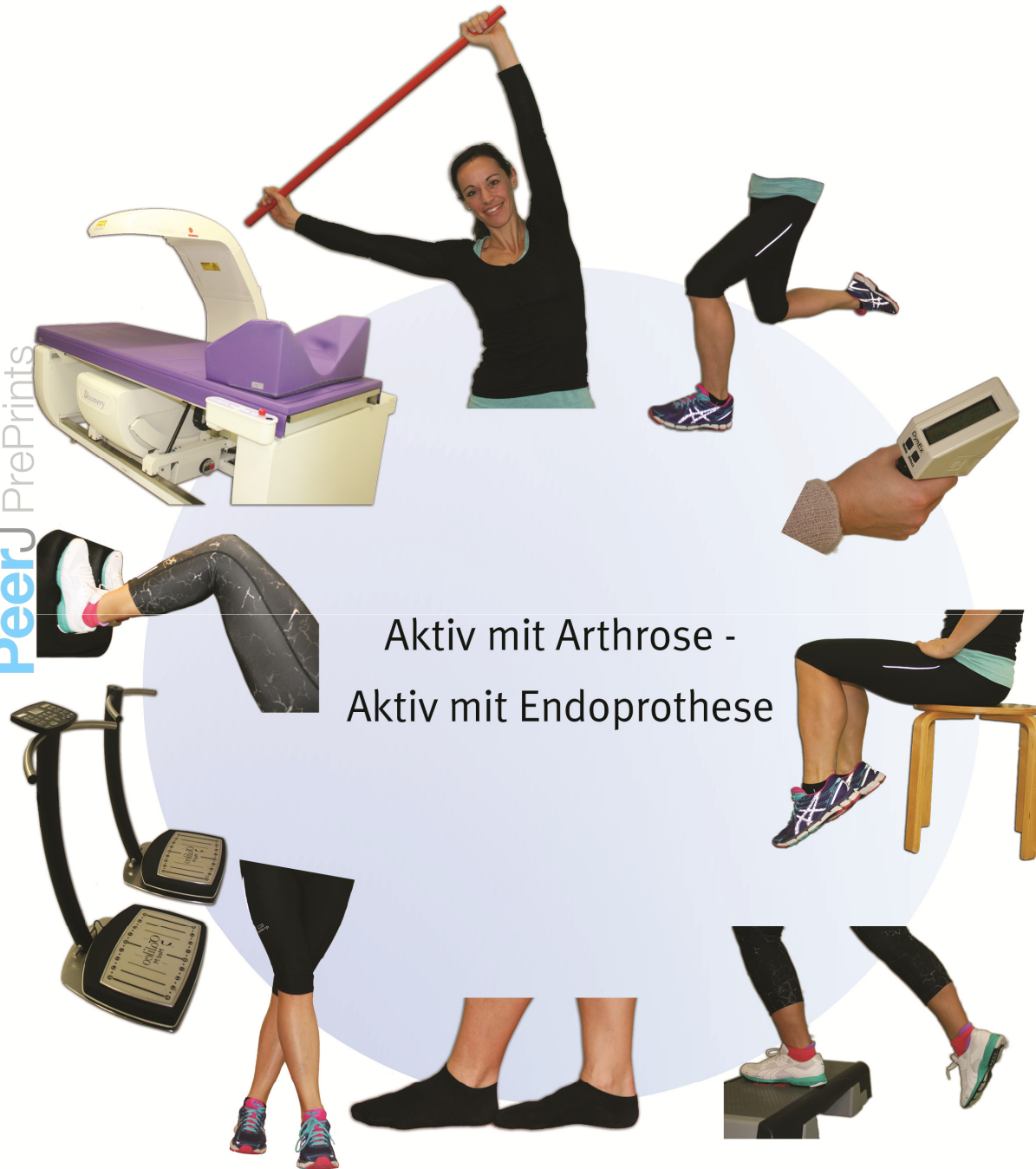
Exercise Groups 2x /Week
with instruction

Min. 4-5x/Week Flexibility and
Strentgh Training

Private training session with
professional PT instructor, if
possible aqua training

Individualized Training on Galileo

Special joint/arthrosis programes

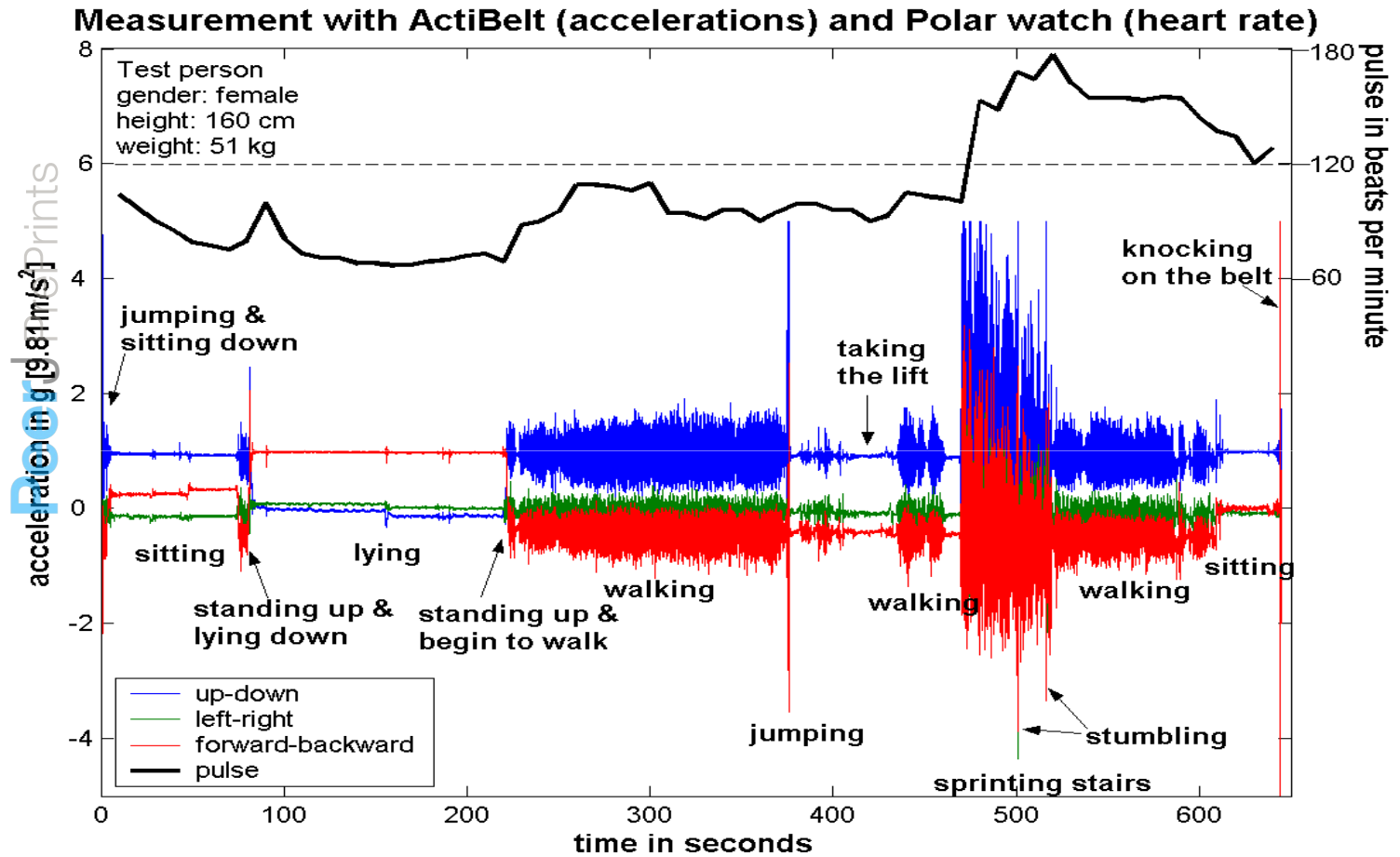


Aktiv mit Arthrose -
Aktiv mit Endoprothese

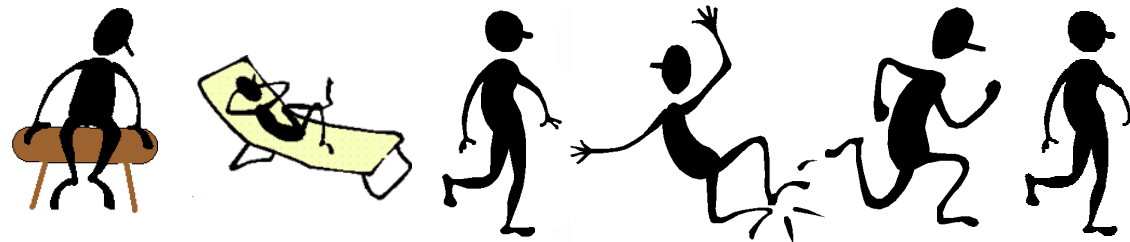


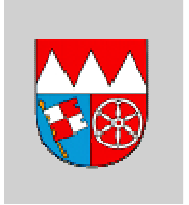
Courtesy of Predia-Institut, Würzburg

Activity monitoring – Actibelt®



Courtesy of
M. Daumer

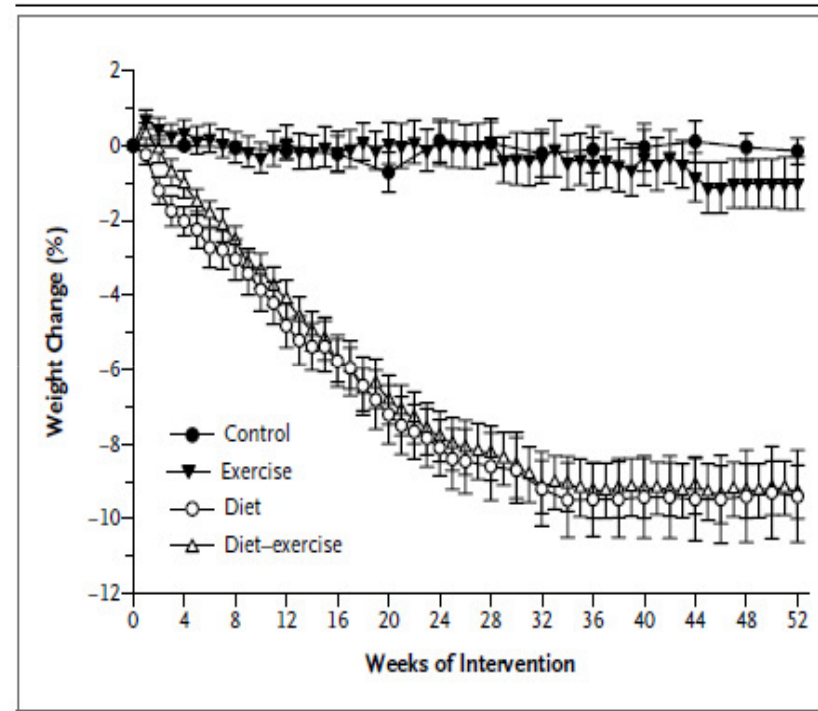
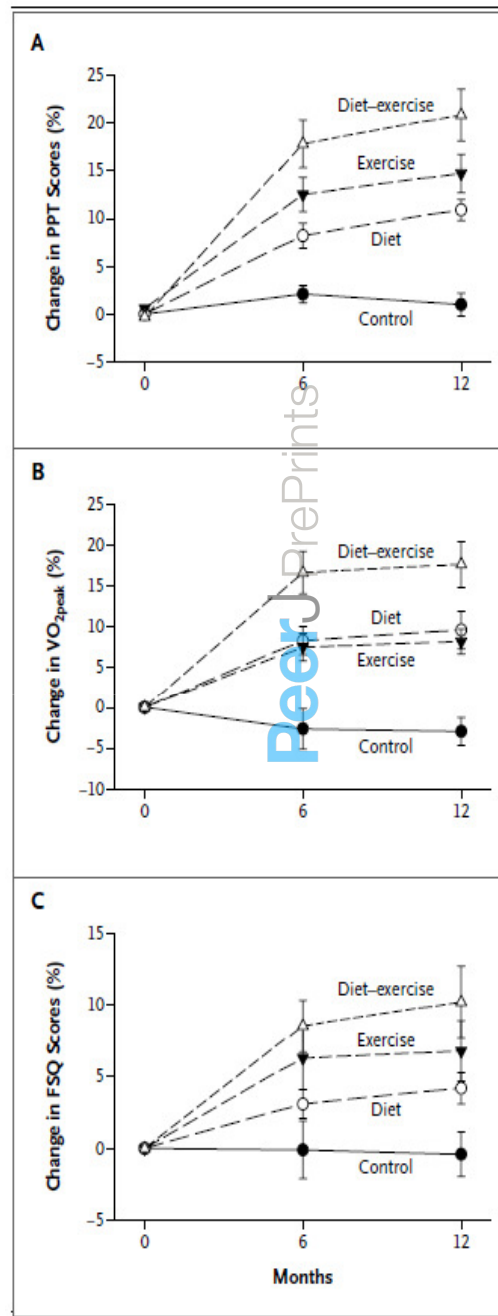




- **What happens in the hospital?**
- **What happens during surgery?**
- **What kind of prosthesis?**
- **Sports after surgery?**
- **Nutrition?**

1) McDonald S, Page MJ, Beringer K, Wasiak J, Sprowson A, Preoperative **education** for hip or knee replacement. Cochrane Database Syst Rev. 2014 May 13;5.

Efficacy of Exercise and Nutrition



- 107 adults > 65 years of age
- balanced diet that provided an energy deficit of 500 to 750 kcal per day from their daily energy requirement
- Three group exercise-training sessions per week aerobic (exercises, resistance training, and exercises to improve flexibility and balance)

- ◆ Physical Performance Test
- ◆ VO_{2peak} = peak oxygen consumption during graded treadmill walking
- ◆ Functional Status Questionnaire

Villareal et al. N Engl J Med 2011;364:1218-29.



EndoPRIME

