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REGAIN MOBILITY AND PHYSICAL AUTONOMY IN SARCOPENIA AND FRAIL PATIENTS: THE LATEST EVIDENCE

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Introduction and Welcome

Chairperson:

Prof. Jürgen M Bauer, MD, PhD

Medical Director at the Department of Geriatric Medicine at the University of Heidelberg. Center for Geriatric Medicine and Network Aging Research, Heidelberg University. Hospital Director of the Agaplesion Bethanien Hospital Heidelberg, Germany.

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Prof. Ivan Bautmans, PT, PhD

Head of the Gerontology Department and Head of the Frailty in Ageing Research Group Vrije Universiteit Brussel, Belgium.

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Prof. Stuart Phillips, PhD

McMaster University, Department of Kinesiology and School of Medicine, Canada.

Introduction
Chairperson

Prof Jürgen M Bauer, MD, PhD
Medical Director at the Department of Geriatric Medicine at the University of Heidelberg. Center for Geriatric Medicine and Network Aging Research, Heidelberg University. Hospital Director of the Agaplesion Bethanien Hospital Heidelberg, Germany.

CHAIRPERSON BIOGRAPHY

In September 2016 Jürgen M. Bauer took over the newly established chair for geriatric medicine at the Ruprecht Karls University Heidelberg, Germany. In the same year Jürgen M. Bauer was elected to serve as the director of the Network Aging Research at Heidelberg University and he is also the director of the Center for Geriatric Medicine at the Agaplesion Bethanien Hospital Heidelberg. Heidelberg University founded in 1386 is Germany`s oldest university and has been continuously ranked among Germany`s top three universities.

From 2010 until 2016 Jürgen M. Bauer had been appointed director of the newly formed Center for Geriatric Medicine Oldenburg, Germany, which is an integral part of the medical campus of the Carl von Ossietzky University Oldenburg, Germany. Between 2004 and 2010 he worked as assistant medical director at the Department of Geriatric Medicine at the University of Erlangen-Nuremberg, Germany. Before moving into the field of geriatric medicine Jürgen M. Bauer was trained in gastroenterology and as a specialist in clinical nutrition.

In recent years, Jürgen M. Bauer's research interest has focused on nutrition and exercise in older persons. He has been a member of several international expert groups that worked on the definitions of sarcopenia and frailty in older persons. In addition, Jürgen M. Bauer contributed to several consensus and research papers that focused on protein intake and amino acid supplementation in older adults.

From 2007 until 2015 he served as a member of the Executive Board of the European Geriatric Medicine Society (EuGMS), while he is currently a member of its Academic Board. In 2018 Jürgen M. Bauer was the congress president of the EuGMS Congress in Berlin. Since September 2016 Jürgen M. Bauer serves as the immediate past-president of the German Society for Geriatric Medicine (DGG). Already in 2007 Jürgen M. Bauer had been awarded the honorary prize of the German Society for Geriatric Medicine.

Jürgen M. Bauer is a member of several national and international medical societies. In 2010 he was honored to become a member of the ESPEN faculty. Since 2015 Jürgen M. Bauer has also been a member of the committee of scientific advisors of the International Osteporosis Foundation (IOF).

ABSTRACT:

As more and more baby-boomers are now reaching retirement age the consequences of the current demographic shift will gain momentum during the next decade thereby exerting increasing pressure on the social systems of most Western Countries and especially on the health care sector. In this context the prevention of loss of autonomy and care dependency will be utmost importance. Geriatric medicine has to address these challenges and if it succeds in doing it will not only increase the quality of life of the older population, but it will also strengthen the position of geriatric medicine among the medical disciplines.

The geriatric syndromes sarcopenia and frailty are both associated with accelerated functional decline and finally disability. Both share a complex etiology that includes numerous aging processes, lifestyle factors and negative effects of a large number of comorbidities. In the individual patient the contribution of these factors varies widely and therefore we should aim to provide our patients with more differentiated diagnosis of sarcopenia and frailty in the future. A future sarcopenia and frailty diagnosis would reflect the variable contribution of the different etiologies the latter being identified with the help of a series of biomarkers. This concept would serve as an example of personal geriatric medicine when we complement this diagnostic approach with a more differentiated therapeutic concept. In 2021 there is still no drug on the horizon that is likely to be approved for the therapy of sarcopenia or frailty within the next five years.

Therefore we still have to stick to the established therapeutic standards which are exercise and nutrition. In recent years we have significantly expanded our knowledge on how we can optimize the positive effects of exercise and nutrition in patients that are affected by sarcopenia and frailty. However, open questions remain.

For example, we have to address specifically the dosing and timing of the aforementioned interventions, if we want to optimize the functional results in our patients. We still need more large, well-designed studies that reflect the heterogeneity of the older population. Only then we will able to establish the "perfect" intervention that is targeted,well-defined, accessible, efficient, affordable and most likely continuous. Although we have not achieved this ambitious goal yet, relevant progress has been made. This symposium will provide all participants with highly relevant up-to-date-information in this regard and it will be presented by excellent and highly respechted experts in the field.

How hard and how often to exercise? - Intensity and efficiency of resistance training in older persons with sarcopenia and frailty

Prof. Ivan Bautmans, PT, PhD
Head of the Gerontology Department and Head of the Frailty in Ageing Research Group
Vrije Universiteit Brussel,
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SPEAKER BIOGRAPHY

Ivan Bautmans (°25 FEB 1973, ORCID: 0000-0002-6820-9586, Research ID: C-3435-2014) is MSc Physiotherapy & PhD Medical Sciences, and an expert in biogerontological research: physical training of older persons, sarcopenia and inflammation. His work on muscle fatigue in frailty was awarded by 6 scientific prizes among which the 3 most prestigious Belgian gerontology awards (2013 King Baudouin Foundation's PRIZE MARIE-THÉRÈSE DE LAVA; 2009 DE COOMAN PRIZE; 2010 BORGERHOFF PRIZE). He obtained funding from FWO, VUB, Willy Gepts Fund, EU (FP7, AAL), WCF (The Netherlands) and sponsored clinical trials.

Ivan is full-time appointed as tenured professor (hoogleraar) at the Vrije Universiteit Brussel (VUB) where he is head of the Gerontology and Frailty in Ageing research (https://fria.research.vub.be) departments. He coordinates an Interdisciplinary Research Program @VUB on Active and Healthy Ageing, and a Strategic Growth Research Program @VUB on the anti-inflammatory effects of exercise in the aged. At the VUB he is coordinator of the Research Master of Gerontological Sciences (www.vub.ac.be/en/study/research-master-gerontological-sciences) where he gives lectures on healthy ageing & research methodology. He is also board member (President elect in 2013-2015) of the Belgian Society for Gerontology & Geriatrics (www.geriatrie.be) and founding board member of the Belgian Ageing Muscle Society (www.ageingmuscle.be).

At SOMT University of Physiotherapy (Amersfoort, The Netherlands) he is scientific advisor and PI of the Fatigue Resistance AMErsfoort (FRAME) study and the AMersfoort COhort study on functional decline, Healthy ageing & Frailty (AMCOHF) study. @SOMT he gives lectures on geriatric rehabilitation and is responsible for the Master Thesis of the students in Geriatric Physiotherapy. He published 136 full papers in international peer reviewed journals (ISI Web of Science H-index=36) and is promotor of 15 successfully defended PhD's and 9 ongoing PhD's.

ABSTRACT:

Resistance training is one of the most efficient exercise modalities to counter muscle weakness in the aged (Beckwee, Delaere et al. 2019). It is therefore not surprising that this type of exercise has a major place in the recent World Health Organisation (WHO) guidelines for physical activity in older persons. In fact, the WHO published in 2020 an updated guideline on physical activity and sedentary behaviour (Bull, Al-Ansari et al. 2020). These guidelines include specific

recommendations for older adults, older adults with chronic conditions (cancer survivors, arterial hypertension, type-2 diabetes and HIV) and adults living with disability (multiple sclerosis, spinal cord injury, cognitive disorders). Besides the recommendation for a sufficient weekly volume of aerobic physical activity, the WHO advocates at least on 2 days per week resistance exercise, this for all categories of older adults.

Typically, resistance training consists of performing muscle work against an external resistance. This external resistance can be produced by ones own body weight, using free weights or specific exercise machines. Moreover, resistance training can be performed at various modalities depending on the level of external load, the number of repetitions, the speed of movement, the number of series, and the duration of rest between the series. The external load is defined by the one repetition maximum (1RM, the maximal weight that can be moved/lifted only once), which needs to be assessed for each person individually. Resistance training using submaximal external load (i.e. 70-80% of 1RM) has been shown to be the best method to increase muscle strength in older persons. At this external load, one is able to perform about 8-12 repetitions before the exercising muscle is tired. Two to three series with at least 1 minute rest in between provides an ideal workout.

Although it is a very safe type of exercise, it is recommended to start the first exercise sessions at a lower external load (e.g. 50% of 1RM) and to increase progressively the external load by about 10% every 2-3 sessions until 70-80% of 1RM is reached. At least one day of rest between the exercise sessions is recommended. This progressive increase of external resistance will allow the older person to get acquainted with the exercises and will avoid excessive muscle soreness the days after the first exercise sessions. When performing this type of resistance training 2-3 times per week during 12 weeks more than 40% of strength gain can be obtained (Peterson, Rhea et al. 2010, Beckwee, Delaere et al. 2019). When performing resistance training with lower external loads, the number of repetitions should be increased. In fact, muscle failure at the end of the resistance exercise is considered as one of the key triggers for neuromuscular adaptation to occur (Van Roie, Delecluse et al. 2013, Arnold and Bautmans 2014, James, Nichols et al. 2021). However, resistance training at low external resistance will lead to a lower strength gain, even when performing a very high number of repetitions (Van Roie, Delecluse et al. 2013).

Interestingly, resistance training also induces the production of myokines by the exercising muscle (Pedersen 2011). These myokines are small proteins that stimulate local autocrine and paracrine effects in the muscle. Many myokines are also released in the blood circulation exerting endocrine effects including energy metabolism (release of glycogen stores from the liver, increased lipolysis etc) and immune responses (Pedersen 2012, Laurens, Bergouignan et al. 2020). The latter contribute to an overall anti-inflammatory effect (Petersen and Pedersen 2005, Bautmans, Salimans et al. 2021, Mathot, Liberman et al. 2021). It is well known that ageing is often accompanied by the occurrence of a chronic low-grade inflammatory profile (CLIP) that accelerates the progression of sarcopenia and frailty. Thus, resistance training can combat both muscle weakness and chronic inflammation in the aged. The anti-inflammatory effect of resistance training is also related to the duration and intensity of the exercise, and proposing exercise at sufficient intensity is therefore necessary to stimulate this mechanism (Forti, Van Roie et al. 2016).

In this lecture we will explain the recommended amount of resistance exercise and its dosing according to the aimed training effects and the clinical profile of older persons.

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The perfect match – High protein supplementation, and exercise for the prevention and therapy of sarcopenia and frailty

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SPEAKER BIOGRAPHY

Stuart Phillips is a full Professor in the Department of Kinesiology and a member of the School of Medicine at McMaster University. He is Tier 1 Canada Research Chair in Skeletal Muscle Health. He is also the Director of the McMaster University Physical Activity Centre of Excellence. Dr. Phillips has authored more than 220 original research papers and 90 reviews. He is a 5-time nominee, and a 3-time recipient, of McMaster Student Union's Outstanding Teaching Award. He was the inaugural recipient of the Canadian Society for Exercise Physiology's Mentorship award in 2017. In 2018-20 he was named to Clarivate's Highly Cited Researchers list as a being in the top 1% of all cited researchers in nutrition and physiology research. Dr. Phillips is a fellow of the American College of Sports Medicine and the Canadian Academy of Health Sciences. His work and enthusiasm for science are supported by an outstanding group of talented and industrious undergraduate, graduate students and research fellows.

ABSTRACT:

With age, declining function and whether it can be ameliorated is a basic question at the core of biologic gerontology. Skeletal muscle is a malleable tissue with ageing, and its mass and function of which, when lost, is termed sarcopenia. The recent designation with an International Classification of Diseases (ICD-10) code to sarcopenia by the World Health Organization represents a significant step towards recognizing the age-related loss of SMM and muscle function as a disease requiring healthcare intervention (Anker, Morley et al. 2016, Cao and Morley 2016).

Maintaining skeletal muscle and function are important core health goals for ageing persons. Numerous guidelines have outlined why older persons need to maintain their skeletal muscle and muscle function, translating into a lower risk of mobility loss (Bhasin, Travison et al. 2020). At its most basic level, skeletal muscle protein mass is maintained by the simultaneous and opposing processes of muscle protein synthesis (MPS) and muscle protein breakdown (MPB). For net muscle mass accretion to occur, MPS must chronically exceed MPB, and the converse is also true for muscle loss.

The two main stimuli for that affect MPS are protein ingestion and muscle loading. Without sufficient protein, or specifically without sufficient essential amino acid (EAA) intake, there is inadequate stimulation of MPS, and muscle mass will decline (Phillips 2017). Age-related mal- or under-nutrition, poor

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dentition, and declining appetite further limit older persons' ability to obtain sufficient protein. We also know that older persons have what is known as age-related 'anabolic resistance,' which means that older persons' muscles respond less well than younger ones to normally robust anabolic stimuli like protein ingestion and loading. Anabolic resistance and other reasons underpin an increased need for protein in older persons; however, it is important to realize that older persons can achieve similar stimulation of MPS with protein ingestion as seen in younger persons, but only when greater quantities of protein are consumed. The critical amino acid to stimulate MPS is leucine, and proteins rich in this, and other EAA, would be the most efficient way to achieve (for any given protein load) the most robust stimulation of MPS.

A valid question is then, which types of proteins are the best at supporting a net protein balance? Clearly, it would be those proteins that have a high leucine, high EAA, and are easily digested. Viewed from this perspective, no other protein matches milk-dervied protein as a blend of casein (a slowly digested protein that suppresses protein breakdown) and whey (a rapidly digestd protein that stimulates protein synthesis) (Boirie, Dangin et al. 1997). The so-called slow and fast protein blend in most milks independently regulates MPS (Pennings, Boirie et al. 2011) and casein and whey as a mixture have the highest amino acid score when measured using the state-of-the-art digestible indispensable amino score (DIAAS) of and the highest leucine amino acid reference ratio (Rutherfurd, Fanning et al. 2015). These characteristics of milk proteins make them the most efficient source of leucine and EAA per g of protein nitrogen and thus good sources for at-risk populations such as the elderly and other clinical populations (Phillips and Martinson 2019).

Similarly to protein ingestion, without sufficient loading, muscle mass also declines. Muscle disuse/unloading-induced atrophy is likely due to a reduction in MPS and possibly an increase in MPB. Nowhere is this more apparent than when patients spend time on prolonged bed rest. In an older person, in whom muscle mass is declining due to sarcopenia and is experiencing age-related anabolic resistance, one can imagine that even periodic muscle disuse is a problem as it results in precipitous and rapid declines in muscle mass and function (Oikawa, Holloway et al. 2019). The loss of muscle in older persons means a loss of the tissue that constitutes 'functional reserve' and may explain why prolonged bed rest is so damaging to long-term health in this population.

In this talk, the mechanisms of stimulation of MPS and suppression of MPB by protein and loading (as exercise or physical activity) in older persons will be discussed. The concept of aggressive intervention to prevent disuse-induced declines in muscle mass in older persons will also be discussed. Attendees can learn how muscle mass is regulated and how MPS and MPB are stimulated with protein ingestion and loading.

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