# Exercise and nutrition to support healthy aging

# Valorization

In current times, ever increasing scientific, socio-economic and political attention is going out to the health implications of global aging. Considering the demographic development over the past decades as well as the population projections for the upcoming period, this is hardly surprising. Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%. Even more striking, the number of people aged 80 y and older is expected to more than triple, from 125 million in 2015 to 434 million by 2050 (1). Similar expectations have been reported for the Netherlands, where the growth of the total population will mainly be due to increased longevity. In line with the tripling on a global level, the number of Dutch people aged 80 y and over is expected to increase from 700,000 at present to 2 million in 2060 (2). The fact that people live longer is a positive sign in many ways, as life expectancy in itself is clearly associated with the general health of the population as well as the quality of the health care system. However, it also poses many challenges to maintain health and functional capacity in older people. This is essential to limit their social isolation, prevent the loss of independence, and ensure that quality of life is not exchanged with the extra years to live (1). Aging is generally accompanied by a decline in skeletal muscle mass, also known as sarcopenia. Loss of skeletal muscle mass may lead to a reduction in muscle strength and physical function, which increases the risk of falls and fractures. This could ultimately result in the loss of independence and an increase in nursing home admissions. Developing effective interventions to prevent or delay the onset of sarcopenia may improve the quality of life of older individuals, and simultaneously reduce the health care costs associated with impairments in physical functioning. This thesis focused on both exercise and nutritional interventions to counteract the negative consequences of age-related sarcopenia. Here, we shortly address how our findings may be relevant to define future research goals as well as how they should be implemented into intervention strategies aimed at healthy aging of our society.

This thesis provides further evidence that resistance type exercise training is one of the most potent stimuli to increase muscle mass, strength and functional capacity in the healthy elderly population. However, our findings as well as those from multiple other long term training studies need to be translated and implemented into daily practice. We need a structure in which physical activity is facilitated, supported, and encouraged. This includes both the trigger to become more physically active, and the continued stimulus to remain active. Such a process may entail the commitment of 1) scientists to provide the evidence showing the (health) benefits of exercise; 2) policy makers to provide the financial and/or (infra)structural conditions needed for implementation; 3) health professionals to convince the elderly of the need for being physically active; and 4) health insurance companies to (financially) stimulate physical activity both in terms of disease treatment and prevention. Obviously, a multidisciplinary approach is needed to create a different mindset at all these levels. Yet, there is already general awareness for the need to remain actively involved in society and to maintain inde-

pendence throughout a lifetime. The next step is to really make this happen. There is ample evidence that lifestyle intervention programs, including both exercise and nutritional aspects, can lead to great improvements in muscle mass and functional capacity, as well as (metabolic) health. More work is needed to support these findings through large-scale efficacy studies in which the benefits may become even more evident in terms of improved quality of life and reduced health care costs. The latter may also include cost-effectiveness studies, considering the enormous health-care costs associated with specific age-related morbidity. For example, reduced fall risk due to improved muscle mass, strength and balance may lead to a reduction in the number of hip fractures, which represents a major health care cost for the elderly population, and is associated with both decreased quality of life and increased mortality. We have clearly shown that with proper guidance and supervision, resistance type exercise training represents a feasible means to improve overall physical functioning in healthy elderly men and women. In addition, recent work also suggests that even structured, moderate-intensity physical activity programs can already reduce major mobility disability among older adults at risk for disability (3). We propose that the time has come to start with the actual implementation of physical activity programs for the general older population.

Apart from the healthy elderly men and women included in the training study described in this thesis, we have also focused on elderly type 2 diabetes patients. In this population we observed a significant larger decrease in muscle mass and strength compared to healthy elderly. As such, this specific patient group likely needs specific tailored interventions. In fact, this may also be the case for other more compromised elderly subpopulations, such as more frail elderly, COPD patients, cancer patients, etc. Considering the multi-morbidity that is often evident in these subgroups, a more interdisciplinary approach between e.g., exercise physiologists, diabetes nurses, clinicians and other health care professionals should be pursued to create the leverage needed to change (clinical) practice. Previous work has already shown to some extent that (resistance type) exercise training in these populations can represent an efficient addition to their general care program. However, more work is needed to tailor intervention programs to the needs of such specific patient groups, especially when focusing on improving muscle mass and function.

For all the studies discussed in this thesis, we failed to show the additional benefits of amino acid or protein supplementation. However, in a recent meta-analysis (4), we did observe an additional benefit of protein supplementation on top of the effects of prolonged resistance type exercise training. In line with this observation, more recent work focusing on specifically tailored nutritional interventions, either alone or in combination with resistance type exercise, indeed shows improvements in muscle mass and function in the elderly following nutritional co-intervention (5-7). Current evidence indicates that optimizing dietary protein intake is of key importance for the elderly in general, and may be even of even greater relevance for those at higher risk of develop-

ing sarcopenia and frailty. Recent position stands also refer to the need for separate protein recommendations for older people, even specifying different subcategories (8). Future work should focus on verifying these recommendations and evaluating the separate and combined effects of resistance type exercise and tailored protein supplementation in various subgroups of (more clinically compromised) elderly. These studies should build on knowledge obtained from short-term 'acute' studies, selecting those strategies that will likely induce the strongest effects. This may include differentiation in the amount, type, and composition of the protein, as well as the timing of protein intake (e.g., providing additional protein at breakfast and/or lunch, and even prior to sleep). Such knowledge is essential for adopting new recommendations on food intake in the elderly. Furthermore, it will provide ample leads for the development of specific nutritional products and/or supplements tailored towards the needs of the ever growing number of older people in our society. Overall, increased attention and awareness for the main adjustable lifestyle factors, i.e., physical activity and nutrition, should form the basis for improving muscle mass and function in the elderly, both from a healthy aging and from a clinical perspective.

In summary, counteracting or preventing muscle loss with aging is of major importance for the quality of life of the older individual, but also from an economic perspective regarding the health care costs associated with sarcopenia. In addition to the healthy aging population and elderly with diabetes, the results from this thesis can be translated into other clinical conditions where progressive skeletal muscle mass loss plays an important role in reducing physical functioning, including conditions such as cancer cachexia, chronic obstructive pulmonary disease (COPD), renal insufficiency, and cardiovascular disease. Scientific evidence showing the importance of both exercise interventions and nutritional strategies to increase protein intake in the elderly is slowly accumulating (9), and the time has now come to translate these findings into clinical practice. The (clinical) nutritional industry aims to develop new products/concepts to support healthy aging. The findings from this thesis will give direction for future research aiming at the development of novel exercise, nutritional and/or pharmaceutical interventions to combat the loss of skeletal muscle mass, strength, and functional capacity in a variety of older subpopulations.

In the next decade much of our knowledge on the impact of physical activity and nutrition on muscle mass and strength preservation will be applied in interventional strategies to support healthy aging.

## References


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