FINAL ORAL EXAMINATION
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

OF

SAMANEH FARSIJANI
SCHOOL OF DIETETICS AND HUMAN NUTRITION

PRESERVING MUSCLE MASS, STRENGTH AND PERFORMANCE IN
FREE-LIVING OLDER ADULTS: A FOCUS ON DIETARY PROTEIN
QUANTITY, DISTRIBUTION AND DAIRY PRODUCTS

April 5, 2017
1:00 PM

RAYMOND BUILDING, R3-045
McGill University, MacDonald Campus

COMMITTEE:
Dr. Don Smith, Pro-Dean, Department of Plant Science
Dr. Tim Johns, Departmental Chair, School of Dietetics and Human Nutrition
Dr. Stéphanie Chevalier, Supervisor, Division of Geriatric Medicine
Dr. José A. Morais, Internal Member, Division of Geriatric Medicine
Dr. Grace Marquis, Internal Examiner, School of Dietetics and Human Nutrition
Dr. Christina Wolfson, External Member, Department of Epidemiology, Biostatistics & Occupational Health

Dr. Josephine Nalbantoglu, Dean of Graduate and Postdoctoral Studies
Members of the Faculty and Graduate Students
are invited to attend
Older people form the fastest growing proportion of the world’s population. Loss of muscle mass and strength, known as sarcopenia, and impaired physical function are well-recognized aspects of aging.

Sarcopenia is considered an important predictor of frailty, disability, institutionalization and mortality, imposing a heavy burden on the healthcare system. Among many possible etiologic factors, an unbalanced diet and specifically inadequate protein intake, is thought to contribute to sarcopenia in senior adults. It remains to be determined whether mealtime distribution of protein intake, independent of protein quantity, affects muscle mass and physical performance in older adults in the long-term. Despite the potential contribution of dietary factors to healthy aging, the role of dairy products on body composition and physical performance in free-living older adults has been scarcely studied in longitudinal studies.

The global objectives of this thesis are: (1) to examine the extent to which total protein intake and mealtime protein distribution are associated with lean mass (LM) and appendicular LM (aLM) and their 2-y changes; (2) to examine the cross-sectional and longitudinal relationship between mealtime distribution of protein intake and physical performance; and (3) to investigate the association between total dairy intake and changes in body composition and physical performance over 3 years, using the NuAge database (Quebec Longitudinal Study on Nutrition as a Determinant of Successful Aging) in community-dwelling men and women (aged 67-84 y). In this thesis, dietary data were extracted from 2 sets of three nonconsecutive 24-h food recalls collected at baseline (T0) and after 2 years (T2). Participants’ protein intake was adjusted to their energy intake using the nutrient residual energy-adjustment method. Protein distribution across meals was calculated as the coefficient of variation (CV) of g protein ingested per meal, with lower values reflecting the evenness of protein intake. In Study 1, body composition data were analyzed in 351 men and 361 women with available dual-energy X-ray absorptiometry data at T0 and 2-y follow-up. In Study 2, two functional composite scores (muscle strength from handgrip, arm and leg strength; and mobility from timed up-and-go, chair stand, normal and fast walking speed tests) were analyzed in 827 men and 914 women over 3 years. In Study 3, participants (n=1499) were assessed for their total dairy intakes (milk, cheese, yogurt and dairy-based desserts). Frailty was defined according to Fried et al. 2001 criteria. In all studies, mixed model analysis was used to examine trajectories of muscle mass, strength and mobility across time, by sex, as conditioned by studied variables (i.e. protein quantity, distribution and total dairy intake), adjusted for potential covariates.

Results from Study 1 showed that an even protein intake distribution across meals, independent of the total protein amount, was associated with higher LM and aLM in both older men and women throughout the entire follow-up. However, neither protein quantity nor distribution affected the rate
of LM loss in either sex. In Study 2, a more even distribution of protein intake was associated with higher muscle strength, but not mobility function, in both sexes throughout the entire follow-up (3 years), independently of the total protein intake. Despite a steady deterioration of physical performance over 3 years, it was not affected by protein intake distribution in either sex. Study 3 showed independent associations between higher dairy consumption and higher LM and a better mobility score throughout follow-up in both sexes. Higher dairy intake was inversely associated with body fat in women, while the association was positive in men. Additionally, the risk of pre-frailty/frailty was lower among high dairy consumers in men. However, time-dependent changes in body composition, muscle strength or physical performance were not related to dairy intake in either sex.

Our studies strongly support that specific nutritional approaches, e.g., higher and a more evenly distributed protein intake as well as higher dairy intake, are independently associated with higher muscle mass and better physical function, but not with their changes over our short (2-3 years) follow-up in the elderly. However, having a higher baseline lean mass and strength may indicate a delay in reaching the sarcopenic threshold even at the same rate of decline. Nevertheless, longer-term and larger observational and clinical trials are warranted to support future recommendations.
CURRICULUM VITAE

UNIVERSITY EDUCATION

2011/9 – 2017/6 Ph.D Candidate, Human Nutrition, McGill University, Montréal, Canada.
Dissertation: Preserving Muscle Mass, Strength and Performance in Free-living Older Adults: A Focus on Dietary Protein Quantity, Distribution and Dairy Products.

Dissertation with Merit: The effects of flavonoids in berry extract on individual protein synthesis rate in human intestinal Caco-2 cell lines.

2003/9 – 2007/8 B.Sc., Honors, Nutrition and Dietetics, Shahid Beheshti Medical University, Tehran, Iran.
Dissertation with distinction: Determining the amount of dietary saturated, unsaturated fat and antioxidants in the diet of patients with cardiovascular diseases from Greater Tehran.

EMPLOYMENT

2007/12 – 2009/7 Freelance dietitian (RD. Iranian Medical Council No. T2494), Tehran, Iran.

2011/9 – 2015/4 Teaching Assistantships, School of Dietetics and Human Nutrition, McGill University.
2015/1 – 2015/4 Clinical Nutrition I (NUTR-344)
2013/9 – 2013/12 Clinical Nutrition II (NUTR-454)
2013/1 – 2013/2 Nutritional Assessments (NUTR-436)
2012/9 – 2012/12 Human Nutrition (NUTR-307)
2012/1 – 2012/4 Introduction to Psychology (NUTR-301)
2011/9 – 2011/12 Clinical Nutrition II (NUTR-545)

AWARDS

2017/4 Finalist in the American Society for Nutrition's Emerging Leader Poster Competition. Experimental Biology, Chicago, IL.
2016/06 Research Trainees Travel Award. McGill Division of Endocrinology & Metabolism.
2016/05 Poster Award. Experimental, Therapeutics & Metabolism (ETM) Research Day, McGill University.
2016/04 Best abstract award in ASN, Energy and Macronutrient Interest Group, Experimental Biology, San Diego, CA.
2016/02 Travel Award, Quebec Network for Research on Aging (RQRV).

2015/5  Abstract Award for outstanding research related to the CNS thematic conference. Canadian Nutrition Society (CNS)

2015/5  CNS Trainee Award/ Poster Competition: One of the 8 finalists in the poster competition.


2014/4  Graduate Excellence Award (90020), McGill University.

2012/9–2013/8  Graduate Excellence Award (00071), McGill University.

2011/9–2012/8  Graduate Excellence Fellowship (90071AG), McGill University.

2003-2007  Dean of Nutrition and Dietetics Award for Excellence in Academic Records, Shahid Beheshti University of Medical Sciences & Health Services, Tehran, Iran.

**PUBLICATIONS**

*Published:*


*Under peer-review: revisions required*


Ready to submit:


**PRESENTATIONS**

**Oral Presentations**


**Farsijani**, Morais, Payette H, Gaudreau P, Shatenstein B, Gray-Donald K, Chevalier S. The relationship between mealtime distribution of protein intake and lean mass loss in free-living older adults of the NuAge study. Experimental Therapeutics and Metabolism Seminar Series, McGill University Research Institute, Glen Hospital, Montreal, Quebec, Canada. January 2016.

**Poster Presentations**


**Farsijani S**, Morais JA, Payette H, Gaudreau P, Shatenstein B, Gray-Donald K, Chevalier S. The Relation between mealtime distribution of protein intake and lean mass loss in free-living older adults of the NuAge study. 2016 Endocrine Retreat, McGill Division of Endocrinology & Metabolism, McGill University, Montreal, Canada. May, 2016 (*Winner of poster competition*).


Farsijani S, Payette H, Shatenstein B, Gaudreau P, Morais JA, Chevalier S. Dairy intakes of older adults of the NuAge longitudinal study: Impact on body
weight and composition, physical and cognitive functions, metabolic profile and inflammation. Health Outcomes Axis & McGill Geriatric Division Research Day, Montreal, Quebec, Canada, June 12, 2014. (Winner of poster competition).