

Title: Nutritional and lifestyle predictors of skeletal muscle mass and function

Supervisors: Dr Aivaras Ratkevicius (Lithuanian Sports University, LSU) and Dr Stuart Gray (University of Glasgow, UoG)

Importance of research

It is believed that nutrition and lifestyle have a major influence on skeletal muscle function, though there is often shortage of evidence in support of these claims as specific studies have often been hampered by low numbers of participants. Between April 2007 and December 2010 the UK Biobank recruited 502,628 people (age 40-70years) from the general population. A wide variety of data was collected including physical activity levels, handgrip strength, body composition, nutritional intake, genetics as well as information on health status. In approximately 20,000 participants repeated measurements of handgrip strength and body composition were made 4-5 years after the initial assessment. This resource is open for all researchers to access and we have had several high impact publications using this data (1, 2).

Research questions

The current PhD proposal would utilise this resource and have the following aims:

- 1) Determination of the nutritional and lifestyle predictors of muscle mass, fat mass and handgrip strength;
- 2) Determination of the nutritional and lifestyle predictors of the decline in muscle mass, fat mass and handgrip strength over time.

Following this epidemiology investigation we are planning to conduct experimental studies with the aim of testing the findings. Previous studies indicate that the likely candidates which are important for the maintenance of muscle mass and function are factors such as dietary protein, oily fish intake, sedentary behaviour etc. We are particularly interested in factors that help to maintain muscle mass when physical activity levels are drastically reduced as in case of unilateral lower limb suspension. Such an intervention is common in clinical practise when injury is sustained in one of the lower limbs. The studies of this intervention show that significant decline in muscle mass can be observed after only 10-12 days of such an intervention (3). We will aim to investigate the effect of a nutritional intervention on the loss of muscle mass and function during the unilateral lower limb suspension (ULLS).

The PhD student would benefit from the joint expertise of LSU and UoG and we would envisage that the student would visit Glasgow for initial training in analysis of the UK Biobank data. Continued support would then be in place with regular Skype and face-to-face meetings with both supervisors.

References

1. Celis-Morales CA, Petermann F, Hui L, Lyall DM, Iliodromiti S, McLaren J, Anderson J, Welsh P, Mackay DF, Pell JP, Sattar N, Gill JMR, Gray SR. Associations Between Diabetes and Both Cardiovascular Disease and All-Cause Mortality Are Modified by Grip Strength: Evidence From UK Biobank, a Prospective Population-Based Cohort Study. *Diabetes Care*. 2017 Dec;40(12):1710-1718. doi: 10.2337/dc17-0921. Epub 2017 Oct 6.
2. Celis-Morales CA, Lyall DM, Gray SR, Steell L, Anderson J, Iliodromiti S, Welsh P, Guo Y, Petermann F, Mackay DF, Bailey MES, Pell JP, Gill JMR, Sattar N. Dietary fat and total energy intake modifies the association of genetic profile risk score on obesity: evidence from 48 170 UK Biobank participants. *Int J Obes (Lond)*. 2017 Dec;41(12):1761-1768. doi: 10.1038/ijo.2017.169. Epub 2017 Jul 24.
3. Psatha M, Wu Z, Gammie FM, Ratkevicius A, Wackerhage H, Lee JH, Redpath TW, Gilbert FJ, Ashcroft GP, Meakin JR, Aspden RM. A longitudinal MRI study of muscle atrophy during lower leg immobilization following ankle fracture. *J Magn Reson Imaging* 35(3):686-95, 2012