

PARTICIPANT INFORMATION SHEET

Modulation of muscle force control with ageing and physical (in)activity

Invitation to participate

Dr Jamie Pethick of the School of Sport, Rehabilitation and Exercise Sciences at the University of Essex invites you to take part in a research study. Before you decide whether to take part, it is important you understand why the research is being done and what it will involve. Please take your time to read the following information carefully and ask if there is anything that is unclear, or if you require further information.

What is the purpose and background of the study?

In comparison to young adults, older adults exhibit a poorer ability to control muscle force, i.e. to perform smooth and steady contractions. This age-related decrease in the ability to control force is associated with poorer performance in tests of balance, mobility and even driving! Moreover, it has been suggested to be more closely related to declines in the ability to perform these tests than the age-related decrease in maximal force generating capacity.

Research on the age-related decrease in force control and its functional consequences has, however, only been conducted in more sedentary (i.e. inactive) individuals. Physical inactivity is the most important factor accelerating age-related declines in physiological function, while physical activity is the most important factor in slowing such decline. Indeed, lifelong physically active older adults have been demonstrated to have better preservation of muscle strength than age-matched inactive adults. No study to date has, however, investigated whether lifelong physical (in)activity effects the age-related decrease in force control. Consequently, the purpose of this study is to address this significant knowledge gap.

Who can and cannot be included in the study?

I am seeking three specific groups of adults:

- Young adults, aged 18-35
- Inactive older adults, aged over 50, who do not take part in any sport or exercise training
- Lifelong physically activity older adults, aged over 50, who train for a specific sport for 3-6 hours per week

You must also be free from cardiovascular, respiratory, musculoskeletal and neurological conditions, be a non-smoker, not taking daily medication or suffering from long-COVID. Prior to participation, you will be asked to fill out a medical questionnaire to ensure you meet the study's inclusion criteria and to ensure your readiness to participate in physical activity.

Do I have to take part?

No, but if you do decide to take part you will be given this Information Sheet to keep and will be asked to sign an Informed Consent form. You will be free to withdraw from the study at any time, without having to provide a reason and you can ask to have your data withdrawn from the data analysis. If you do wish to withdraw, please contact Dr Jamie Pethick (jp20193@essex.ac.uk).

What will I have to do?

You will be asked to visit a laboratory at the School of Sport, Rehabilitation and Exercise Sciences (at the University of Essex's Wivenhoe Park campus) on two separate occasions. These visits will be at approximately the same time of day and will be separated by at least 7 days.

Visit 1 – Force control measurements

At the start of the first visit, you will be familiarised with the equipment and protocols used to measure muscle force control. Following this, measures of force control will be taken using the muscles of your hip, knee and ankle.

Setup: You will be positioned on an isokinetic dynamometer (a chair and lever arm used to measure a muscle's force; Figure 1). For measurements at the hip you will be stood up, while for measurements at the knee and ankle you will be seated on the dynamometer's chair.



Figure 1. The isokinetic dynamometer.

Force control measures: The measures at the hip will involve abduction and adduction (Figure 2a), the measures at the knee will involve extension (Figure 2b) and the measures at the ankle will involve dorsiflexion and plantarflexion (Figure 2c)

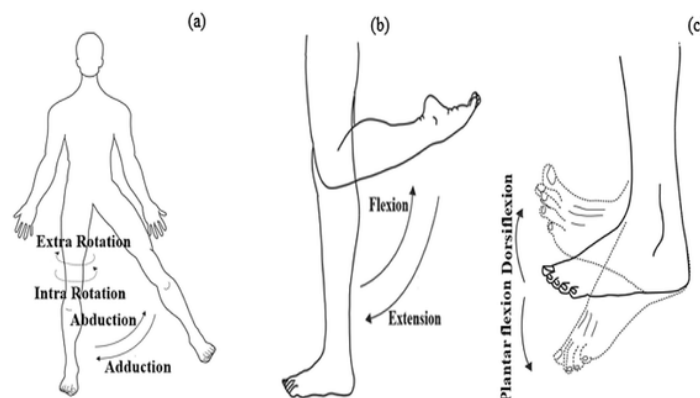


Figure 2. Movements to be performed. a = hip abduction and adduction; b = knee extension; c = ankle dorsiflexion and plantarflexion.

For each of the muscle groups tested, the procedure will be the same. You will be required to perform a series of three maximal isometric knee extension efforts (MVCs), separated by at least 60 seconds rest. During these isometric efforts, your leg will be “locked” at a specific angle and you will be required to try to generate as much muscle force as possible for 3 seconds. These contractions will assess your maximal muscle force.

After five minutes rest, you will next be required to perform a series of targeted contractions at 5, 10, 20 and 40% of your MVC. During these efforts, a target line will be displayed on a screen in front of you and you will be required to match your effort as closely as possible to the target. You will perform four contractions at each intensity, lasting 12, 18, 24 and 30 seconds, respectively, with 30 seconds rest separating each contraction. There will be two minutes rest between each intensity and the intensities will be performed in a randomised

order. These contractions will assess your ability to control muscle force. After 10 minutes rest, you will repeat this procedure for the next muscle group.

Accelerometry: At the end of the visit, a small device called an activPAL will be fitted to your upper thigh. This is to be worn until you return to the laboratory for your second visit. It will be used to measure and confirm your physical activity status, which it does by measuring parameters such as daily steps taken and time spent sitting/lying down.

Visit 2 – Balance measurements

At the start of the second visit, you will be familiarised with the equipment and protocols used to measure balance. Following this, measures of your static and dynamic balance will be taken.

Static balance: You will stand on a force plate embedded into the floor whilst your postural sway is measured. You will be required to stand as still as possible with your feet together and arms crossed over your chest for 50 seconds. You will do this in four conditions: eyes open standing on a firm surface, eyes closed standing on a firm surface, eyes open standing on a foam surface and eyes closed standing on a foam surface. During each of these conditions, if you take a step or remove your hands from your shoulders, a second trial will need to be performed. After 10 minutes rest, you will move on to the measurement of dynamic balance.

Dynamic balance: Measurement of dynamic balance involves the Y balance test (Figure 3). This involves standing on one leg on an elevated footplate and attempting to push a rectangular block along a piece of tubing with your other foot. You will be required to push the block in each of three directions, which form the shape of the letter Y. You will perform the test first with your left leg on the elevated footplate and your right leg pushing and will perform three efforts in each of the reach directions (anterior, posteromedial and posterolateral). This procedure will then be repeated with your right leg on the elevated footplate and your left leg pushing.

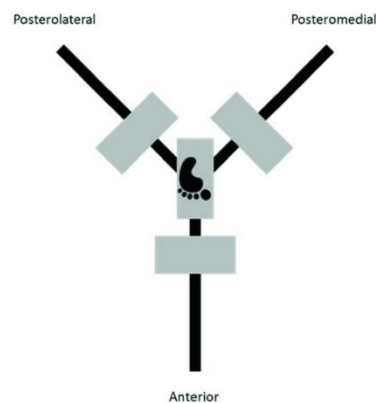


Figure 3. The Y balance test.

How long does it take?

The first visit will take no longer than 90 minutes. The second visit will take no longer than 60 minutes. The approximate maximum duration of time required to complete all visits of the study will, therefore, be 150 minutes (or 2.5 hours). All visits will be completed within two weeks.

What precautions are in place to protect against COVID?

When moving around campus, you should adhere to the University policies in place (which can be found at <https://www.essex.ac.uk/student/how-to-come-onto-our-campus-student>). Before and after your visit to the laboratory, all equipment will be thoroughly sanitised.

What are the possible disadvantages and risks of taking part?

You may experience mild discomfort as a result of the maximal efforts during the first visit to the laboratory. This discomfort will be minimised through familiarisation session at the start of the visit.

What are the possible benefits of taking part?

You will be helping to further our knowledge and understanding of the effects physical (in)activity across the lifetime has on our physiology and ability to function.

What information will be collected?

Measures of maximal muscle strength and ability to force control in the muscles of the hip, knee and ankle will be taken in the first visit. Measures of static and dynamic balance will be taken in the second visit.

Will my information be kept confidential?

All data collected and analysed during the study, and any personal information, will be stored securely in accordance with the Data Protection Act and the University of Essex's own data protection requirements. No data will be passed on to any third party. Personal data will not be stored after the end of the study. Anonymised data will be stored for up to ten years, as it may be required at a later date for further analysis. When the study is published, no references will be made that could reveal an individual participant's identity.

All electronic data will be stored on a University of Essex shared drive and an encrypted, password protected laptop belonging to the principal researcher. Transfer of data will only be done if essential and will be accomplished using a secure file transfer software. Any written data will be stored in a locked filing cabinet.

What is the legal basis for using the data and who is the Data Controller?

By providing your freely-given, informed consent, you provide the research team with the legal basis for processing your data. This is in accordance with the GDPR. The Data Controller is the University of Essex and the contact is the University Information Assurance Manager (dpo@essex.ac.uk).

What should I do if I want to take part?

If you are interested in participating, would like more information, or have any specific questions, please do not hesitate to contact Dr Jamie Pethick, jp20193@essex.ac.uk.

What will happen to the results of the research study?

The results of the study will be written up and submitted to a scientific journal. If you are interested in the results of the study, you can leave your contact details with the researcher. You will then be sent a summary of the findings and a full PDF copy of the study, should it be published in a journal.

Who has reviewed the study?

This study has been reviewed and approved by the Ethics Sub-Committee 2 at the University of Essex.

Concerns and Complaints

If you have any concerns about any aspect of the study or you have a complaint, in the first instance please contact the principal investigator of the project (Dr Jamie Pethick, jp20193@essex.ac.uk). If you are still concerned, you think your complaint has not been addressed to your satisfaction or you feel that you cannot approach the principal investigator, please contact the School of Sport, Rehabilitation and Exercise Sciences Director of Research (Dr Ruth Lowry, r.lowry@essex.ac.uk). If you are still not satisfied, please contact the University's Research Governance and Planning Manager (Sarah Manning-Press,

sarahm@essex.ac.uk). Please include the ERAMS reference number which can be found at the foot of the page.

Research Team Members

The research team consists of Dr Jamie Pethick (jp20193@essex.ac.uk), a lecturer and researcher affiliated with the School of Sport, Rehabilitation and Exercise Sciences at the University of Essex.

Thank you for taking the time to read this information sheet. If you are happy to participate in the study, please indicate your consent by signing the Informed Consent form.