

LIVERPOOL JOHN MOORES UNIVERSITY  
PARTICIPANT INFORMATION SHEET



**NON-ELITE SOCCER PLAYERS (OVER 16 YEARS OLD)**

**Title of Project:**

Physiological Determinants of Rapid Force Production in Elite Soccer

**Name of Researchers and School/Faculty:**

David Robshaw, School of Sport and Exercise Science / Faculty of Science

You are being invited to take part in a research study. Before you decide it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide if you want to take part or not.

**What is the purpose of the study?**

The aims of the PhD project are:

1. quantify the contribution of lower limb muscle-tendon properties to soccer-specific powerful actions;
2. investigate how these properties differ between elite youth soccer players and recreational players at different stages of maturation;

**What will happen to me if I take part?**

To participate in this project you must be, healthy and asymptomatic of illness and pre-existing injuries. In addition, you must have competed in soccer match-play for at least 3 years previously, and must currently participate in soccer specific training at least 3 times per week, cumulating to at least 3 hours of training time per week.

This study will be conducted in the Sport and Exercise Science Laboratories at Liverpool John Moores University (LJMU University, Tom Reilly Building Byrom Street, Liverpool, L3 3A).

If you volunteer to participate in this project, you will be asked to perform various tests which are detailed below. There are a number of core assessments which all participants who volunteer and provide consent will be asked to perform.

*Core Procedures:*

You will be required to visit the Sport and Exercise Science Laboratories at Liverpool John Moores University and/or Liverpool Football Club Melwood Training Ground on two occasions consisting of one familiarisation session, and one testing session. During each session you will need to wear normal gym/training clothing. You will not be allowed to participate in strenuous physical activity 48 hours prior to both visits to the Sport and Exercise Science Laboratories at Liverpool John Moores University. You should also abstain from alcohol during the whole test period and caffeine for a minimum of 12 hours prior to each testing session.

Prior to your familiarization session, you will be asked to complete a short questionnaire to assess your health status and footballing achievements. Also, your body mass (kg) and height (cm) will be measured. During the familiarization and testing sessions, you will be required to perform the following tests:

- **Soccer specific maximal power assessment:** This assessment protocol will be performed in the Sport and Exercise Science Laboratories at Liverpool John Moores University, Biomechanics Lab. You will be asked to perform maximal unilateral horizontal and vertical countermovement jumps in addition to bilateral vertical and horizontal drop jumps from a 30 cm box on a force plate. Three jumps will be performed for each jump (18 jumps in total).

More specifically for the drop jumps, you will be asked to drop from a small height on two legs and jump as high as possible landing on the force plate (on two legs). After performing this three times on each leg, you will be asked to drop from the same height on both legs but to jump as far as you can in front of you. For the countermovement jumps you will be asked to start on one leg and jump as high as you can (landing on two legs). Finally you will be asked to jump as far forward as you can on one leg, landing on two. We will measure the amount of power you produce during each jump. Following the jump testing, you will be asked to perform 3 maximal sprints over a 20 m distance (measured at 5 m, 10 m and 20 m intervals) with 60 seconds between trials. This will last approximately 25 minutes.

- **Maximal isometric force and rapid force development:** This assessment protocol will be performed in the Sport and Exercise Science Laboratories at Liverpool John Moores University, Physiology Lab, or, Liverpool Football Club Melwood Training Ground Gym. You will be asked to perform several maximal contractions with your legs in various positions to assess your strength capabilities whilst having electrodes placed on your skin to measure muscle activity during contraction. More specifically, you will be seated on a chair with your leg bent and firstly asked to extend your knee maximally against a lever which will not move. You will perform each contraction three times, holding it for approximately 5 seconds (total of 15 contractions). You will then be asked to do the opposite movement which requires you to flex your knee maximally against an immovable lever. Following the maximal contractions, you will be asked to produce 10-15 contractions as hard and as fast as you can at approximately 80% of your max, holding it for approximately 1 second with 20 seconds rest between contraction. This will last approximately 30 minutes in total. These measures will be repeated immediately and 48 hours post fatigue protocol. During this protocol, EMG electrodes will be placed on your skin to measure the muscle activation during the maximal contractions and the rapid force contractions. This will last approximately 30 minutes
- **Tendon Properties:** The subjects will rest for 5 minutes before the next exercise. With the knee joint set at 90 deg knee flexion, the ultrasound probe will be used to measure the length of the patellar tendon. The probe will then be placed on the skin over the points associated with 0, 25, 50, 75 and 100% tendon length, and the scans will be recorded to measure tendon cross-sectional area (CSA) at these points (and ultimately tendon volume). The same scan will take place for the achilles tendon, whilst the knee is fully extended and the ankle joint is set at 0 deg. During a ramped isometric MVC (which is a contraction which gradually increases in force to a full MVC), the ultrasound probe will be placed longitudinally over the tendon and the tendon elongation will be recorded. These measurements will subsequently be used to assess changes in tendon size and stiffness. The probe will then be placed perpendicular to the direction of the tendon and axial scans will be recorded along the length of the tendon to measure tendon CSA (at 25, 50 and 75% of tendon length) and therefore tendon volume. Following this ramped isometric contraction, your ankle will be passively rotated through 15 degrees within your range of motion at a speed of 1 degree per second. Whilst your ankle is being rotated, an ultrasound probe will be placed over your calf to measure how far your tendon moves, which will allow for your tendon moment arm to be determined. This will take about 20 minutes.

You will be asked to perform the following procedures once only. All testing will take place on the premises of Liverpool Football Club Academy, and/or the Sport and Exercise Science Laboratories at Liverpool John Moores University, Physiology Lab:

- **Anthropometric assessment:** Your body height, weight and sitting height will be measured to the nearest mm, with the subject in bare feet. Body mass will be measured with the participant in shorts only, to the nearest 0.1 kg. Two measurements will be taken for each anthropometric variable.
- **Muscle volume, architecture, physiological cross sectional area (PCSA) and specific force:** You will be asked to lie flat on your back) for 20 min to allow fluid shifts to occur. An ultrasound probe will then be used to scan the vastus lateralis muscle (the muscle on the outside of your thigh) of your dominant leg. During all measurements, you will be asked to relax your leg muscles. The results from these scans will be used to measure muscle volume,

architecture and, physiological cross sectional area of your vastus lateralis muscle. This procedure will last approximately 20 minutes.

### **Are there any risks / benefits involved?**

The risks and benefits of each procedure are documented below. Please read these carefully before deciding whether you would like to participate in the project.

#### *Core Procedures:*

- **All measurements:** Electrical equipment will be used to perform the measurement. The wires could form a trip hazard. The equipment will be checked and the wires will be placed at each testing session.
- **Soccer specific maximal power assessment:** As with any explosive exercise, there is a risk of a muscle injury. Therefore, to ensure this risk is minimised, all participants will be asked to perform a 10 min of warm up and cool down activity during all sessions. However, this will be similar to that which you regularly complete in your sporting performance. This test procedure will allow you to find out how much multidirectional soccer specific power he can produce off each leg. This information can be used to inform future training programmes.
- **Maximal isometric force and tendon properties:** Maximal voluntary contractions require a lot of effort and can be tiring. Therefore, you will be given ample recovery between each attempt. You will be seated at all times and the test will stop if you feel faint. Recovery time will be increased between repetitions/sets before you will be asked if they wish to continue. If you feel any pain due to lifting, or electrical stimulation, the exercise may be stopped depending on the type and cause of the pain. This test will provide you with information on how much force you can produce in the knee extension and knee flexion movements which can be used to inform future individualised training interventions.
- **Muscle volume, architecture, physiological cross sectional area (PCSA) and specific force:** To perform the ultrasound scan, a gel will be used. The gel used for ultrasound might provoke an allergic reaction or irritation of the skin. If this happens, the gel will be washed off.

### **Will my taking part in the study be kept confidential?**

#### Data collection

- Data collection remains strictly confidential between you and the researcher.
- Personal information will be treated in the strictest confidence with no association been made between the subjects identities and the data observed.
- All data collected from you will be anonymised and identifiable by a code – you cannot be identified by simply reading the code.

#### Data storage

- All information/data will be stored confidentially and only accessed by members of the research team. At the end of the study, all personal identifiable information will be deleted.
- Information linking you to the participant code will be stored in a secure place, only accessible by the researcher.
- The handling and storage of all samples, e.g. blood and buccal samples, and extracted DNA, will comply with the Human Tissue Act legislation. The genetic material will be stored so that it can be re-analysed for different gene polymorphisms at a later date.
- Ultrasound and match-play videos will be disposed of once the asked data is has been collected.

### **Contact Details of Researcher**

Further information may be obtained from the following:

**PhD Researcher:** David Robshaw

[D.C.Robshaw@2016.ljmu.ac.uk](mailto:D.C.Robshaw@2016.ljmu.ac.uk)

**Project Supervisor:** Dr Robert Erskine

[R.M.Erskine@ljmu.ac.uk](mailto:R.M.Erskine@ljmu.ac.uk)