

Risk assessment RA15

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Faculty / Service Area:	Faculty of Health Sciences and Sport	Location:	Sport Science laboratories, Other
Description of work task / equipment /area being assessed:			
Eccentric Exercise induced muscle damage			
Head of division	Prof Jayne Donaldson	Safety officer	Dr Nidia Rodriguez Sanchez
Completed by:	Dr Thomas Di Virgilio	Date:	22 Nov 2018
Reviewed by (Line Manager):	Chris Grigson	Date:	10 <sup>th</sup> July 2023
	Dr Nidia Rodriguez Sanchez	Date of next review:	August 2024
Equipment used	Ergometry. Cycle: Lode Excalibur, Corival; Monark 894e. Treadmill: HP Cosmos Pulsar 3P Dynamometry. Kin-Com, Biodex System 4.		
Categories of people involved	Staff, UG, PG, Visitors		
Duration of activity	<1.5hr	Frequency of activity	No more than five times over several weeks per study
Legal compliance to standards and regulations required	Health and Safety at Work act 1974 (HASAWA) <a href="https://www.hse.gov.uk/legislation/hswa.htm">https://www.hse.gov.uk/legislation/hswa.htm</a> Management of Health and Safety at Work Regulations 1999 (MHSWR) <a href="https://www.legislation.gov.uk/uksi/1999/3242/contents/made">https://www.legislation.gov.uk/uksi/1999/3242/contents/made</a> Provision of Work Equipment Regulations 1998 (PUWER) <a href="https://www.hse.gov.uk/work-equipment-machinery/puwer.htm">https://www.hse.gov.uk/work-equipment-machinery/puwer.htm</a>		

Change log		Version 1.1 30 <sup>th</sup> Aug 2022 New format							
		Version 1.2 10 <sup>th</sup> July 2023 Referenced regulations and SOPs							
What are the hazards?	Hazard category	Who might be harmed and how?	What are you already doing to control the risks?	*Risk rating	What additional controls (if any) are required to reduce the risks?	*Risk rating	Action by who?	Action by when?	Date of completion
<b>Muscle damage protocols</b>	F4	Participants will feel discomfort and pain in the limb used for the damage protocol as a result of the strenuous exercise.  Some may struggle to walk and feel pain when walking up/down stairs	Appropriate participant screening* procedures ensure that only eligible and healthy participants can take part  When running on a treadmill participants will be wearing a safety harness to catch them should they fall	Low					
<b>Use of Dynamometers</b>	F4	Investigators and participants  See RAs	RA01, RA16 Instruction SOPs: Kin Com Biodex	Low					
<b>Use of treadmills</b>	F4	Investigators participants  See RAs	RA01, RA20 Instruction SOP: HPCosmos Pulsar	Low					

			When running on a treadmill participants will be wearing a safety harness to catch them should they fall						
<b>References</b>	<p>* Preparticipation medical evaluation for elite athletes  <a href="https://bmjopensem.bmj.com/content/bmjosem/7/4/e001178.full.pdf">https://bmjopensem.bmj.com/content/bmjosem/7/4/e001178.full.pdf</a></p> <p>Activity Risk Assessments                      Standard Operating Procedures</p> <p>RA16 Dynamometers                              KinCom                      Biodex</p> <p>RA17 Bicycle ergometers                        Lode Excalibur            Lode Corival                      Monark 894E</p> <p>RA20 Treadmills                                    HP Cosmos Pulsar 3P</p> <p>Laboratory Risk Assessments</p> <p>RA80_TeachingLab_L19                            RA81_ResistanceLab_3B140                      RA82_PhysiologyLab_3B142</p> <p>RA83_NeuromuscularLab_3B142D            RA84_MultipurposeLab_3A72</p>								

## Standard operating procedure

### **Procedure:**

#### **Exercise induced muscle damage can be elicited using two methods.**

Before starting this protocol read and understand RA01, RA16 for dynamometer, RA20 for treadmills and the SOP for the equipment you will use.

#### **Method 1 – Eccentric isokinetic contractions using isokinetic dynamometer**

Participants will first be instructed to complete a warmup by performing six isometric contractions, each lasting 5 seconds with subjectively increasing force (i.e. 3 x 50% perceived maximal force and 3 x 75% perceived maximal force), with a 10-second rest between contractions.

The EIMD protocol is split into 12 sets, each completed once the participant reached an individually calculated workload. The workload is based on peak eccentric and concentric forces generated by participants during a repetition over a 90° range of motion—from a knee angle of 20° to 110° (with 0° being fully extended limb parallel to ground). During each repetition the participant continuously contracts the quadriceps, i.e., attempts to extend the leg. This flexion forcibly lengthens the muscle fibers, causing eccentric damage. Completion of the eccentric phase (20° → 110° knee angle) and concentric phase (returning from 110° to 20° knee angle) will be considered one repetition.

In order to calculate a workload, each participant will perform three repetitions of the EIMD protocol movement, each separated by 2 minutes. The peak eccentric and concentric forces are determined and the sum is multiplied by an estimated number of total reps to complete each set (taken as 12). This figure is then multiplied by 1.5 to ensure the muscles are maximally worked. Once the workload was reached, the set was completed and the participant has a 2-minute rest before engaging in the subsequent set.

#### **Method 2 – Eccentric exercise using treadmill with negative (i.e. downhill) incline**

Participants will perform a 5min steady pace, low level warm up on the treadmill at 0% gradient. Following adequate warm up participants will complete a 40-min downhill run (-12% gradient) at 70% of their VO<sub>2</sub>max (RA01).