

INFORMED CONSENT RELATING TO THE PROJECT “*MARCIALONGA SCIENCE*”

- Promoter:** CeRiSM (Research Center Sport, Mountain & Health, Verona University) in collaboration with Marcialonga Organizing Committee and Fiamme Gialle Military Group
- Project Manager:** prof. Federico Schena
- Aims of the study:** The study *MARCIALONGA SCIENCE* aims to evaluate the extent of muscular fatigue in upper and lower limbs after a classic long-distance cross-country skiing race. The researchers will propose to the athletes other tests before and during the competition, in order to monitor the level of physiological effort sustained during the Marcialonga race.
- Test protocol:** Before the race, the athletes will perform a maximal incremental test on snow and a test for the determination of the neuromuscular properties of two skeletal muscles (one in the upper and one in the lower limb). The former, will allow researchers to characterize each athlete from a physiological point of view, measuring the maximal oxygen uptake and the exercise intensities at which the two thresholds occur. The latter, will allow the researchers to determine the neuromuscular function, through non-invasive surface electromyographic and electrostimulation measures. During the race, the athletes will be asked to record their own heart rate and the skiing techniques used all over the race. Immediately after the competition, the athletes will perform a second neuromuscular test with the same characteristics of the first one, to determine the level of specific muscular fatigue after the race.
- Use of the data collected:** The data recorded in this study will be analyzed anonymously, together with the data of the other subjects. They will permit to increase the scientific knowledge of this matter and they will be used for conferences, scientific publications and information purposes. Furthermore, they will be available for Master Degree thesis.
- Rights of participants:** Each athlete will participate to the study voluntary. Each athlete has the right to know the data relating to his own performance.
- Duties of participants:** At the first meeting, the athlete will subscribe the informed consent to participate to the study.

Detailed description of each test

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| Test 1: | MAXIMAL INCREMENTAL TEST ON SNOW |
| Specific aims: | To determine the maximal oxygen consumption, the ventilatory, lactic and electromyographic thresholds. |
| Location: | Cross-Country Stadium of Lago di Tesero. "Team leaders" room (near the finish line) and track. |
| Preparation to the test: | Clothing and equipment required: skis, poles and boots for classic technique, suit in two pieces. The athletes will be prepared in the "Team leaders" room. Surface electrodes will be positioned on the skin of the athletes for a non-invasive analysis of the activity of eight muscles, through a surface electromyographic technique. Markers will be attached on the clothes, at the level of the principal joints, for a biomechanical evaluation of the double poling technique. Finally, the athletes will wear a heart rate monitor, a mask and a metabolimeter, for the analysis of heart rate and pulmonary gas exchanges. |
| Test description: | After warm-up, the athletes will perform 5 sub-maximal trials of about 5 minutes at different speeds, using the double poling technique. At the end of each trial, a sample of blood will be taken from the ear lobe, to determine the lactic acid concentration. After an adequate period of rest, the athletes will perform an incremental test to exhaustion, using the double poling technique, to determine the maximal oxygen uptake. During the maximal test, an increase of 0.5 km/h of skiing speed will be imposed each 30 seconds, until exhaustion. At the end, three sample of blood will be taken from the ear lobe. Metabolic, cardiac, kinematic and electromyographical measurements will be also recorded during these tests. |
| Risks and discomforts: | The different instrumentation used for the data recording should make the movement slightly impaired. The researchers will do their best to avoid this possibility. The procedure for the electrodes displacements needs hair removal, light abrasion and cleaning with alcohol of the skin zones overlying the bellies of the muscles considered. |

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| Test 2: | PRE-RACE NEUROMUSCULAR TEST |
| Specific aims: | To determine the force and the muscular activity of the <i>vastus lateralis</i> and <i>triceps brachii</i> muscles, during maximal voluntary isometric contractions (MVC) with electrostimulation. To provide an index of neuromuscular fatigue |
| Location: | Cross-Country Stadium of Lago di Tesero, "Team Leaders" room (in front of the finish line. |
| Preparation to the test: | The athletes must perform this test in a non-fatigued stated, at least 48 hours from the last intensive training session. Clothing requested: shorts. A set of surface electrodes will be applied on the athlete' skin, over the belly of <i>vastus lateralis</i> (lower limb) and <i>triceps brachii</i> muscles (upper limb), right side of the body. Stimulation electrodes will be also applied over the muscle bellies. |
| Test description: | After an adequate warm-up, the athletes will perform some maximal contraction trials, with knee and elbow extensions. Then, electrical stimulations will be applied on <i>vastus lateralis</i> and <i>triceps brachii</i> muscles, to simulate and familiarize with the neuromuscular tests. Moreover, electric stimulations of increased intensity will be applied to the relaxed muscles, to determine the stimulation intensity to use during the tests. <i>Vastus lateralis</i> muscle will be tested first; the subject will be anchored on a special chair through inelastic belts, with 90° of flexion at hip and knee joints. 3 MVC for <i>vastus lateralis</i> muscle will be required, by executing maximal knee extensions. To test the tricipes brachii muscle, the athletes will be anchored on another special chair, with fixed angles of shoulder and elbow. 3 MVC for <i>tricipes brachii</i> muscle will be required, by executing maximal elbow extensions. During each MVC, the athletes will be asked to reach the maximum level of force as rapid as possible and a high frequency double electric stimulation of the muscle will be supra-imposed. Moreover, after each MVC, three more electric stimulations will be applied to the relaxed muscle. At the end of the neuromuscular protocol, a short questionnaire will be submitted to the athletes, to evaluate the rate of perceived exertion. |
| Risks and discomforts: | The procedure for the electrodes displacement needs hair removal, light abrasion and cleaning with alcohol of the skin zones overlying the bellies of the muscles considered. Muscle electrostimulation should be perceived as slightly annoying or painful, because of the rapid muscular contraction induced by the stimulation itself. However, the discomfort is limited to the stimulation period and it does not produce negative effects later. |

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| Test 3: | RACE MONITORING |
| Specific aims: | To monitor and evaluate the physiological effort sustained during the race. To monitor the skiing techniques adopted during the different parts of the path. |
| Location: | Entire Marcialonga path |
| Preparation to the test: | The athletes will wear a heart rate monitor and a device containing an accelerometer. |
| Test Description: | The athletes will record their own heart rate during the entire competition, by using a personal heart rate monitor. The relative file will be downloaded at the end of the race by the researchers. The determination of the skiing technique adopted will be performed considering the accelerations recorded through the accelerometer. |
| Risks and discomforts: | The athletes that are not used to wear a heart rate monitor should find it slightly uncomfortable. The accelerometer looks like a wristwatch, and it does not create discomforts during the race. |

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| Test 4: | POST-RACE NEUROMUSCULAR TEST |
| Specific aims: | To determine the force and the muscular activity of the <i>vastus lateralis</i> and <i>triceps brachii</i> muscles, during maximal voluntary isometric contractions (MVC) with electrostimulation. To provide an index of neuromuscular fatigue |
| Location: | Palacongressi of Cavalese |
| Preparation to the test: | A set of surface electrodes will be applied on the athlete' skin, over the belly of <i>vastus lateralis</i> (lower limb) and <i>triceps brachii</i> muscles (upper limb), right side of the body. Stimulation electrodes will be also applied over the muscle bellies. |
| Test description: | The measures must be taken within 20 minutes from the end of the competition. The athlete will be accompanied to the test location by an authorized. Electric stimulations of increased intensity will be applied to the relaxed muscles, to determine the stimulation intensity to use during the tests. <i>Vastus lateralis</i> muscle will be tested first; the subject will be anchored on a special chair through inelastic belts, with 90° of flexion at hip and knee joints. 3 MVC for <i>vastus lateralis</i> muscle will be required, by executing maximal knee extensions. To test the triceps brachii muscle, the athletes will be anchored on another special chair, with fixed angles of shoulder and elbow. 3 MVC for <i>triceps brachii</i> muscle will be required, by executing maximal elbow extensions. During each MVC, the athletes will be asked to reach the maximum level of force as rapid as possible and a high frequency double electric stimulation of the muscle will be supra-imposed. Moreover, after each MVC, three more electric stimulations will be applied to the relaxed muscle. At the end of the neuromuscular protocol, a short questionnaire will be submitted to the athlete, to evaluate the rate of perceived exertion. |
| Risks and discomforts: | Athletes are required to bear the discomfort due to the timing of the post-race neuromuscular measurements. Maximal collaboration is then asked to the athletes for the validity of this test. The procedure for the electrodes displacement needs hair removal, light abrasion and cleaning with alcohol of the skin zones overlying the bellies of the muscles considered. Muscle electrostimulation should be perceived as slightly annoying or painful, because of the rapid muscular contraction induced by the stimulation itself. However, the discomfort is limited to the stimulation period and it does not produce negative effects later. |

INFORMED CONSENT FORM

Title of the project

MARCIALONGA SCIENCE

Promoter

CeRiSM (Research Center Sport, Mountain & Health, Verona University) in collaboration with Marcialonga Organizing Committee and Fiamme Gialle Military Group

Project Manager

Prof. Federico Schena

The subscriber _____ born in _____ on _____

CERTIFY

- to have received detailed explanations about the participation in the research, in particular about purposes and procedures
- to have read and understood the information sheet
- to participate in the study: "MARCIALONGA SCIENCE", taking part in all the tests proposed
- to participate voluntarily to the study
- to have been informed that the withdraw from the study is allowed at any time
- to be aware that the data collected in the study will be used with the purposes indicated and published anonymously

Place and date _____

Signature of a researcher

Signature of the athlete
