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Description automatically generated with medium confidenceBIP POLI**TO**SPORT

***Neuromuscular adaptations and assessment in sport***

**Tuesday, July 9, 2024**

|  |  |
| --- | --- |
| **Group number:** |  |
| **Group members:** |  |
| **QoI (Question of Interest)** |  |

# Peer-assisted learning

Group are expected to design the most appropriate experimental protocol to address their Question of Interest. The protocol shall be described in this template and uploaded to the course webpage upon the end of the in-presence lecture, July 9, 2024.

Senior students and researchers will be available to assist groups in the identification of key elements to include in the protocol.

## method: how will you address the question of interest

Groups must explain how they intend to address the question of interest. This requires detailing:

* **what will be done and how**
* **which instruments will be used and how**
* **how will data be processed**

### **what will be done and how (max 500 words)**

The sample include 4 out of 5 members (3 male and 1 female), with 1 person excluded to health related problem.

INSERT A TABEL WITH ANTHROPOMETRIC INFORMATION

Insert number of hour of training per week and type of sport, precedent activity

Describe the sample to be recruited (all members of the group? Just one? N of which are male?) and anthropometric information (body mass, height, age, and any other relevant information: athlete? Experience level? …). Report this data with range values preferably, as for example (range; body mass: 71-92 kg; age: 20-40 yrs). When necessary, indicate inclusion and/or exclusion criteria.

After a 10 minutes long warmup, completing walking at a self decided pace (the subject is asked to walk at a speed in which it is comfortable), subject start with the low intensity exercise. In particular they are required to go up to a stair (height ~5 meters, xx step) while keeping the heart rate at xxx bpm equivalent to xx % of maximum bpm. This is repeated 25 time, then right after the end of the last climb the person is required to lay down and the smartphone is put in the centre of the chest. This starts the measuring phase which lasts for 10 minutes, in order to retrieve the required metrics. After the end of this phase the person rest for 30 minutes.   
At the end of the rest starts the high intensity exrcise in which the subject is required to run at its fastest pace on the stairs, repeating it 25 time. At the end of the phase the subject undergoes the same measuring procedure described before.

If there is enough time we are gonna do it another time

Detail what the subjects will be asked to do (e.g., jump, run, stand still, etc). Indicate any specific information that may help readers fully reproduce the protocol. Examples of information to include are: the position of the subject during the task, the instructions provided (if so) before starting the task, period of rest, of warmup, and of familiarization with the task, the number and order of trials and repetitions applied, where the protocol was conducted, and any other relevant information. This information must be presented following a reasonably logic order, possibly ordering events chronologically.

***Insert a figure here (referring to it in the text).*** *outlining the experimental protocol. Use block diagram or nice figures (image or drawings) illustrating the subject in the context of the applied protocol.*

### **which instruments will be used (max 300 words)**

The acceleration data were acquired using the phyphox app running on a Samsung galaxy s22, with sampling frequency of 100 Hz, positioned on the center of the subject chest. The information regarding the heart rate used by the subject during the exercise were given by a Garmin phoenix 6x pro worn on the left arm, using its PPG cardiac sensor. To synchronize both signals the smartphone is shaken at the start of the smartwatch recording.

The resting heart rate is calculated right after the subject wakes up, within the first 5 minutes and without doing any activity before and during the measuring.

The maximal heart rate frequency is calculated using the following equation:

Describe the instruments to be used during the protocol, indicating model and manufacturer. If subjects will be asked to wear any instrument, accessory, or sensor during the trial, indicate how it will be secured to the body segment: remember to provide all information necessary for replicating what has been done.

If necessary, indicate any calibration procedure.

When using multiple data acquisition systems, indicate how they were synchronized.

***Insert a figure here (referring to it in the text).*** *The figure may show, for example, any particular aspect of the instruments used (e.g., the procedure for placing the sensors)****.***

### **how will data be processed (max 300 words)**

Raw accelerometers data are processed in Matlab using a Chebyschev 3th order high pass filter followed by a 6th order Chebyschev. These value were chosen using literature examples, the psd of the raw signal and using the apriori knowledge of the physiological limits in the heart rate. The information coming from the 3 axis were fused in a single value using a squared sum. After this phase the resulting peaks in the total acceleration signal were used to estimate the heart rate with some filtering criteria based on peak prominence and their minimum time distance.

Detail every single procedure to be considered for extracting the metric of interest. From the raw data (video, angle values, acceleration, etc) to the metrics of interest (range of motion, elliptic area, heart rate, etc). Mind about the order with which information is presented: ensure to follow a consistent order, typically the chronological order. The degree of detail to be provided here should be sufficient to understand how, from the data collected, the metrics to be used for addressing the QoI will be computed. Indicate the programming language that will be used to process the data.

***Insert a figure here (referring to it in the text).***  *This figure is sought to illustrate how from raw data the metrics of interest will be obtained.*

**GIVEN THE EXPERIMENTAL PROTOCOL WILL BE CONDUCTED IN THE FOLLOWING DAY, ALL FIGURES TO BE INCLUDED HERE MAY CONVEY SCHEMATIC, HAND-MADE DRAWINGS. GROUPS MAY EITHER DRAW DIRECTLY ON THE DOCUMENT OR INSERT A PICTURE SHOWING THEIR HAND DRAWINGS. NO PERFECTION IS REQUEST, JUST CLARITY OF INFORMATION.**

**THESE FIGURE WILL BE UPDATED WITH REAL DATA ON WEDNESDAY, JULY 10, 2024**