

# Evaluation of Vital Parameter Response to Load Changes Using an Ergometer System in a Group of Healthy Subjects

Alejandro Mendoza García, Ulrich Schreiber, Alois Knoll  
Technical University Munich  
Munich, Germany

**Introduction:** The response of the vital parameters on each person will be different depending on the physical condition. This paper describes a system that was created to evaluate these variations in order to do an estimation of the actual fitness of each individual and their improvement over time. The system consists of an ergometer with a programmable load, a Bioharness sensor to capture heart rate, ECG and respiration, a pulse oximeter for oxygen saturation and a wrist pressure sensor.

**Methods:** A fixed protocol was created consisting of an initial resting time of two minutes to obtain a baseline; afterwards the person was told to cycle for a comfortable speed of 55 rpm. The first minute was applied without a load, afterwards three load steps were given with an increase of 60 watts and a duration of 2 minutes between steps. Once the last step was finished the person is told to stop cycling and a cool down period of 2 minutes is recording, giving the heart enough time to recover.

**Results:** The graph shows the results of the session of one individual user. From this case we can observe that the heart rate started at approx. 75 bpm and reached 140 bpm when maximum load was applied. From all test subjects the resting heart rate ranged from 48 bpm to 80 bpm, and the maximum heart rate ranged from 128bpm to 181 bpm.

**Conclusions:** The proposed system and protocol enabled the study of reactions of the heart rate, respiration and pressure of different users, and from there obtain an estimation of their individual cardiovascular fitness.

