FINDER2E: A SOFTWARE TO CHARACTERISE PHYSICAL ACTIVITY AND ENERGY EXPENDITURE OVER SHORT TIME-INTERVALS IN FREE LIVING VOLUNTEERS

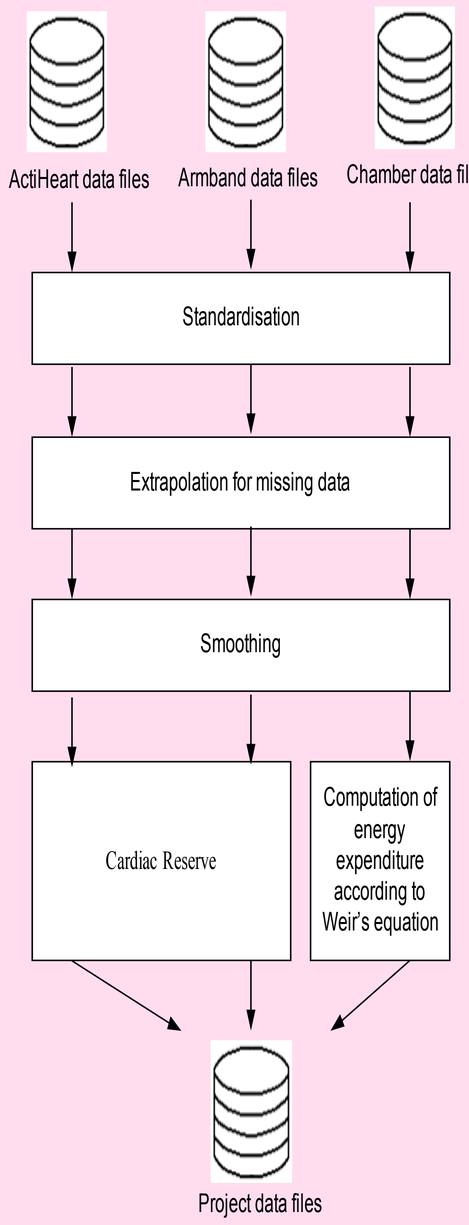
Rousset S. [1], **Lasnes M.** [1.2], **Spriet C.**[1,2], **Walter A**[1,2], **Morio B.**[1], **Lacomme P.**[2]

[1] INRA, Unité de Nutrition Humaine UMR1019, CRNH d'Auvergne, Clermont Ferrand, France

[2] Laboratoire d'Informatique (LIMOS, UMR CNRS 6158), Campus des Cézeaux, Aubière, France

Introduction Typical monitors such as Actiheart and Armband provide day-by-day estimation of energy expenditure. It is also possible to access minute-by-minute estimation of energy expenditure (EE) and parameters (heart rate (HR), accelerometry (ACC), body temperature(θ),…) recorded by these monitors. In our study, we need to be able to easily manage recordings from both monitors and from indirect calorimetry and to extract all pertinent data over short time intervals for each volunteer. The **Finder2E** software we promote, provides a user-friendly interface for mathematical treatment of data including interpolation, regression, smoothing, means and other statistical computations over short periods, and advanced chart series representations. To the best of our knowledge, it is the first software in the energy expenditure field able to simultaneously process all of the files provided by Armband, Actiheart or indirect calorimetry for one or several volunteers over short time intervals. Finder2E is a Java based software which is compatible with Windows or Mac OSX or Linux environments.

Methods The last study carried out by INRA in 2009 provided a large database that includes more than 38 million pieces of physiological data for 120 adults aged 36 to 55 years, either in free-living conditions or in a calorimetric rooms. All volunteers wore an Actiheart and an Armband. The first functionality of Finder2E deals with the preparation of the data from Armband, Actiheart and indirect calorimetry.



Raw data files shows:

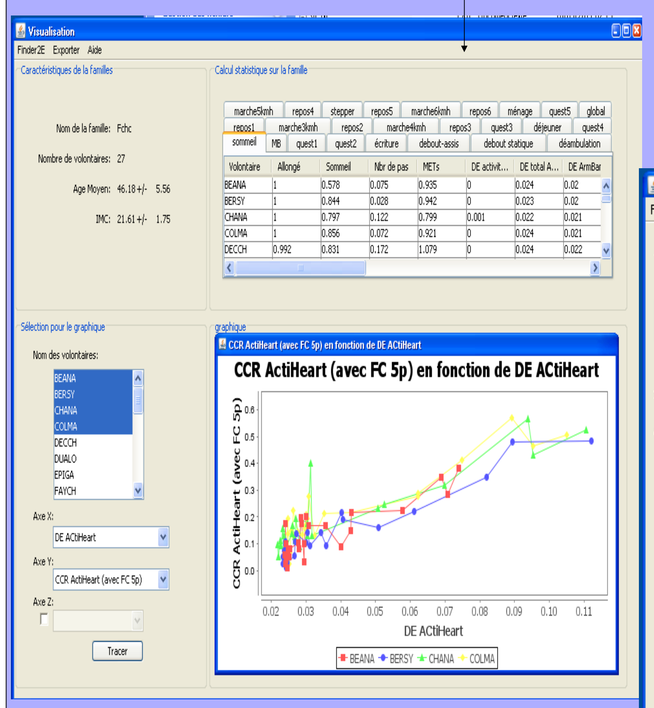
- The files start and end at different hours
- There are numerous missing data of HR and artefacts of measurements
- High variations in individual HR and EE

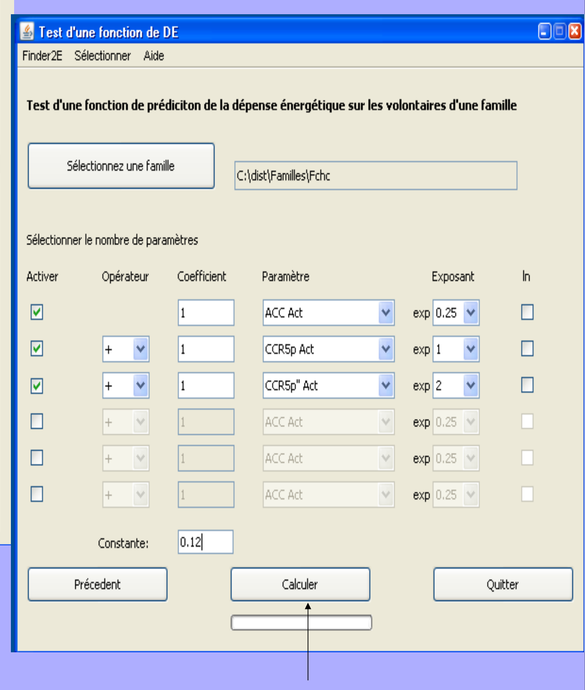
Pre-treatments must be applied:

- Standardisation of start and end hours
- Extrapolation for missing data
- Correction of abnormal values (smoothing)
- Computation of Cardiac Reserve $CR=(HR-HR_{min})/(HR_{max}-HR_{min})$, of the ratio EE/Fat free mass, of EE from $[O_2]$, $[CO_2]$, air flow and temperature (Weir, 1949).

Grouping treatments

- Possibility to create volunteer groups according to age, sex, BMI, VO_{2max} and to edit result sheets and charts on data including EE, METs, ACC, CR, θ … for each short time-intervals recorded in the individual schedules





Test of a prediction function

- The user has to specify a mathematic function based on physiological parameters collected and extracted in a group. These operations required few seconds and gives to the user the possibility to estimate the accuracy of an energy expenditure predictive equation in comparison to a reference method (indirect calorimetry).

Results The main windows gives instant access to the functionalities previously introduced:

- Create a new project or open an existing project & data pre-treatment
- Create groups of volunteers or open an existing group and edit statistical result sheets by individual and by group
- Estimate a mathematical formula for energy expenditure prediction: the user introduces his/her formula and Finder2E gives the prediction.

Conclusion Finder2E gives support to researchers in the field of energy expenditure since it strongly reduces the time required for data extraction and statistical analysis. Our research is now focussed on the improvement of graphical tools including 3D-charts and definition and creation of web services to acquire data from different laboratories or from free living volunteers.