

eMouveRecherche: a scientifically valid application to promote physical activity and well-being

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INTRODUCTION The increase in sedentary behavior over the past years is associated with a growing risk of chronic diseases, overweight and premature death. Nowadays clinical research teams *lack* of valid and cheap devices to track usually volunteer or patient progress in *free-living conditions*. Moreover *interactivity*, i.e. behavioral feedback related to a goal, should be helpful to change a behavior from a distance and in real time. *Smartphones* are the ideal tools for collecting and receiving information at any time. Additionally, they sense the movement intensity with the accelerometers.

- AIM**
- 1) Design and test algorithms for estimating physical activity intensity from *accelerometry* data collected by smartphones
 - 2) Estimate *energy expenditure*

MATERIALS & METHODS

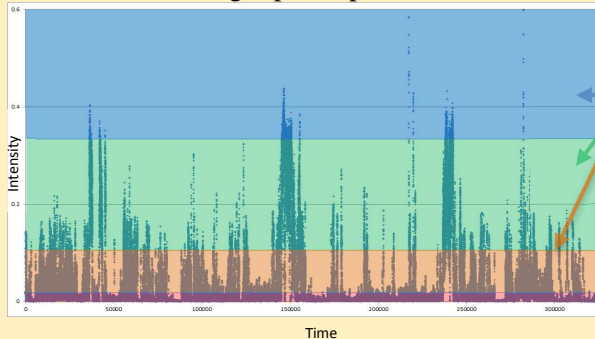
- 2 groups of adult volunteers either *normal weight (NW)* or *obese (OB)* studied both for a controlled activity schedule (sitting, standing, walking, climbing/descending stairs ...; n=25) and in free-living conditions (n=60)
- 4 activity intensities recognized: immobile <2 METs, light [2 – 3.5], moderate [3.5 – 6] and vigorous intensity (>6 METs) MET values were corrected according to individual characteristics (weight, sex, age ...)
- Total energy expenditure reference (TEE^{ref}): Armband and/or indirect calorimetry device (FitmatePro)
- Design of an estimating TEE function $TEE^{f(Acc)}$ from accelerometry data collected from a smartphone in a trouser front pocket
- Comparison between the function and the references of TEE: determination of gaps in absolute value

$$gap(\%) = \frac{TEE^{f(Acc)} - TEE^{ref}}{TEE^{ref}} \times 100$$

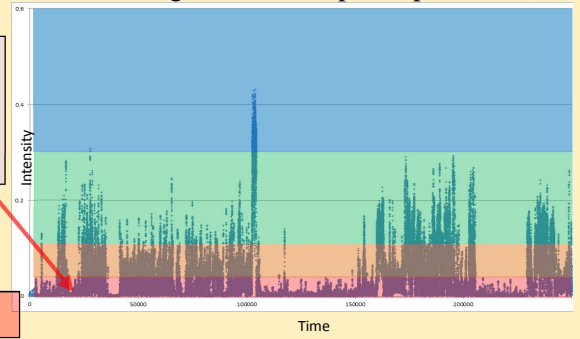
RESULTS

Accelerometry signals associated to spontaneous activities in free-living conditions

Normal-weight participants (NW)



Overweight and obese participants (OB)

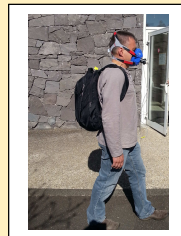
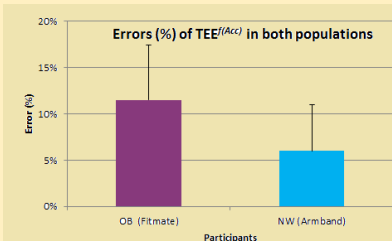
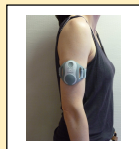


Analysis

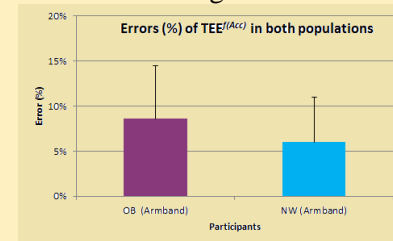
- NW were more frequently **active** than OB
- OB spent more time **immobile** than NW

Validity of $TEE^{f(Acc)}$ function

In controlled conditions



In free-living conditions



CONCLUSION : The errors of $TEE^{f(Acc)}$ were lower than 10 % compared to the references, **satisfying results**. The application is adapted to normal-weight and overweight adults to quantify daily-living physical activities and sedentarity. 'eMouveRecherche' is **operational** and **available** for research studies. The $TEE^{f(Acc)}$ algorithms were implemented on *ActivCollector* Web Platform (<https://activcollector.clermont.inra.fr/>) that also shows the different steps of our work.



<http://goo.gl/SHQ0D7>



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