

encourages the development of self-management and autonomy abilities. The increasing concern in providing quality of life for elderly people and the heterogeneity related to their health conditions, make it urgent to develop customized exercise programs. Health status information arises as a primary indicator to personalize exercise plans and using technologies can simplify that. Thus, it is important to introduce ICT in exercise programs on a perspective of empowerment and making elderly more responsible for their own health.

ExTra4Health – *Exercise Training for Health* – is a community-based exercise program for sedentary elderly people ( $\geq 65$  years old) without any contraindications for exercise. This evidence-based exercise intervention involves the combination of resisted, aerobic and agility

exercises, accumulating a total of 180 minutes per week. It is expected a gradual introduction of ICT in the monitoring of the exercise program, whilst promoting the execution of the tasks in a home-based environment, with continuous follow-up and routine adaptation by the research team.

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NanoSTIMA: Macro-to-Nano Human Sensing: Towards Integrated Multimodal Health Monitoring and Analytics, NORTE-01-0145-FEDER-000016.

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## Sedentary behaviour and physical activity in older adults: systematic review

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#### INTRODUCTION:

The regular practice of physical activity (PA) is associated with several health benefits as decrease of blood pressure; improved cholesterol levels; decrease the risk of developing some forms of cancer, coronary heart diseases, type 2 diabetes, stroke, (WHO, 2008), cognitive decline and dementia (Marmeleira, Godinho & Fernandes, 2009). Sedentary behavior is a risk factor for the development of some diseases described above. (Katzmarzyk, 2010). This behavior is defined by low energy expenditure in leisure activities ( $< 1.5$  METs) (Matthews et al, 2008). Therefore, it is important to understand the physical activity levels of older people, to be possible, in the future, to prescribe adequate physical activity programs.

#### OBJECTIVES

The aim of this study was collect and analyze published literature relating to physical activity and sedentary behaviour levels in older

adults.

#### METHODOLOGY

Using the following keywords: older adults, elderly, physical activity, sedentary behaviour, sedentary behaviour, levels, patterns, habits, prevalence, questionnaire, accelerom\*, self report and diary we searched 6 databases; PubMed, SportDiscus, ScienceDirect, CINAHL, MedicLatina and Medline.

Studies were included if they written in the English, Spanish or Portuguese language, included key study outcomes, healthy older adults 65 years or over.

#### RESULTS

Ninety-two records were screened, and sixteen articles met the inclusion criteria.

Fifteen studies used objective measures (accelerometer) and a research used subjective measures (International Physical Activity Questionnaire).

The studies with accelerometry showed that

59% of older adults do not do the recommended physical activity recommendations. The sedentary behaviour is very high in this type of population. In included studies, the time spent in physical activity decreases as age increases.

### CONCLUSIONS

This systematic review showed that the physical activity levels in older adults are low. It is important to implement health promotion strategies for prevent the increase of the daily PA in older people.

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## Technology to Monitoring Physical Exercise: State of the Art and Future Developments

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### INTRODUCTION

The aims of this study were to analyze the state of art and future developments on the monitoring technology of physical exercise and provide an in-depth discussion of technologies and outcome measures utilized.

### METHOD

The research process was conducted on the “Web of Science” databases. Fourteen studies were included in the analysis after a selection process according to the following inclusion criteria: 1) Original studies about technologies to monitoring physical exercise. 2) Studies must involve humans.

### RESULTS

The fourteen reviewed studies were referred to Smart Apps, Home-based Interactive Training effectiveness, the interaction Human/Robot and the effectiveness of a heart rate monitoring devices. A total of 620 subjects were investigated, 134 male, 195 female and 291 non-identified subjects. Investigations were performed on young and older healthy

adults, however, the clinical condition was not specified in some studies. Accelerometers and inertial sensors were used to capture body movement patterns, postures, counting steps and repetitions. The heart rate was also evaluated, as well as, cognitive aspects related to motivation, memory and wellbeing. Most of the reviewed studies reported positive results with respect to improvements in physical activity parameters and cognitive aspects related to motivation, memory and wellbeing.

### CONCLUSION

Most of the technologies in the literature evaluate physical activity parameters, but not physical exercise. The number of controlled studies examining technologies to exercise monitoring remains small. The computer-based multimedia approaches can create a relatively individualized learning session for a client. The challenge is to properly use and apply the technology for patient learning and that the patient–provider relationship should be enhanced, not replaced.