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Short version

"PHYSICAL FITNESS AND COGNITIVE PERFORMANCE OF THE ELDERLY - COMPETITION AS AN ADDITIONAL MOTIVATION FOR PROMOTING AN ACTIVE LIFESTYLE"



Instituto Politécnico de Viana do Castelo

Escola Superior
de Desporto e Lazer

Pedro Bezerra

João Camões

Jose Maria Cancela





**PROJECT IN COMMON SPORTS
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1. Introduction

Physical inactivity, as a behavior risk factor, is regarded as the greatest public health problem of the 21st century, because of its high prevalence in the world population and associated problems. The negative effect of a sedentary lifestyle has been associated with an increased risk of morbidity, cardiovascular disease, congestive heart failure (CHF), stroke, osteoporosis, obesity, type 2 diabetes, some types of cancer and hypertension. Such context led the World Health Organization (WHO) in 2014 to set, within the 9 global non-communicable diseases - the reduction of 25% in premature mortality from cardiovascular diseases, cancers, and diabetes by 2025; a 10% relative reduction in the prevalence of insufficient physical activity.

Frailty syndrome is an age-associated condition that is characterized by decreases in the functional reserve and resistance to stressors, related to different physiological systems. This syndrome is strongly associated with sarcopenia and puts older individuals at special risk for disability, hospitalization, and death induced by falls. Frailty also increases with age and is associated with disease and disability and can be identified by the presence of three or more of the following criteria: unintentional weight loss, weakness, slow walking speed, low physical activity, and exhaustion.

Another issue is the body composition changes overtime, which is an important hallmark of the ageing process. The excess of weight has been associated to increased mortality. Using BMI as a risk factor to health, evidence showed some mortality protection among the BMI range of 25–30 kg/m² (overweight), in elderly population.

Consistent scientific data described the significant role of muscle strength on functional activities, of the elderly daily routines, having a huge impact on another health determinants. Exercising and performance are associated with inflammatory biomarkers. Reduced inflammation is associated with an increased physical fitness performance and may be also associated with lesser degree of central obesity.

Literature has also reported that physical activity intervention programs, aiming to develop physical capacities in aged people, have positive effects on function and autonomy. It has seen an evolution of the physical activity guidelines with constant update recommendations regarding the different dimensions: frequency, intensity, time and type.





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The project aimed to evaluate the health-related physical fitness and cognitive performance, and self-perception of health, in aged population. Also, it was also investigated the motivation for systematic physical activity, the influence on social inclusion.

2. Methods

The research was developed in five European countries – Portugal, Italy, Spain, Bulgaria and Hungary- throughout 3 years (follow-up).

Four moments of assessment were designed: March/April 2018, September/October 2018, March/April 2019, September/October 2019. A multidisciplinary team was engaged in order to develop the participant's recruitment.

The timeline assessments were specific illustrated in figure 1.

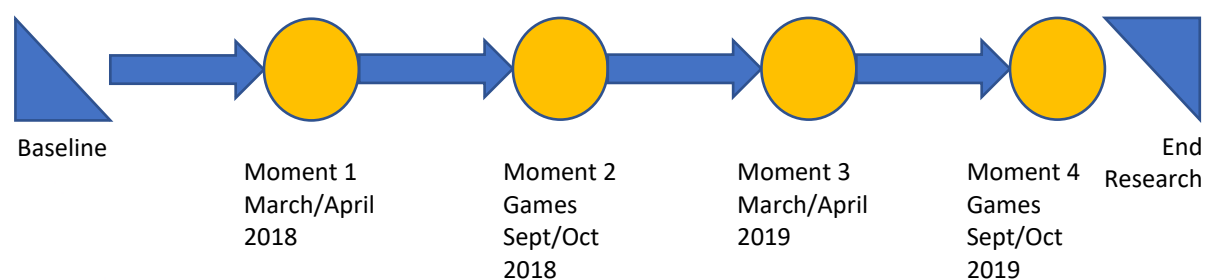


Figure 1 – Timeline of the four participants assessments

Participants

Elders from the 5 countries were recruited to participated on the project. The cohort have 418 elders, being 305 females (72.9%), with a mean age of 70.63±6.75 years, height of 160.0±8.48 cm, weight of 73.49±12.50 Kg, BMI of 28.68±4.56 kg/m²).

Two groups were defined – Experimental Group (EG), a Control Group (CG). The EG undertake training prescription, twice a week, looking at the competition, named as “games” group; the CG was asked to maintain the regular daily routines, not enrolled in formal competition, named as “NoGames” group.

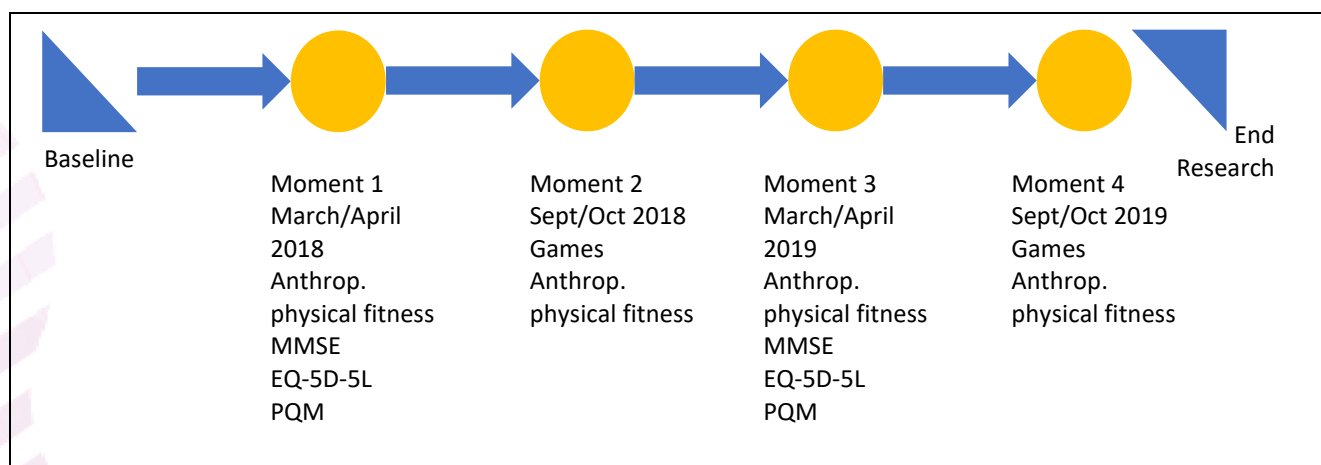


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2.1. Assessment

In this experimental study, assessment sessions were performed in an appropriate place available by the local multidisciplinary team, under the supervision of researchers from the IPVC and Vigo University.

Participants were assessed on anthropometric measures and physical fitness by the Rikli & Jones protocol, in all moments. The MiniMental State Examination, Participation Motivation Questionnaire and Questionnaire EQ-5D-5L were assessed in moment 1 and 3 (for details, see Figure 2).



Note: Anthrop - anthropometric measures; physical fitness - Rikli & Jones protocol; MMSE - MiniMental State Examination; EQ-5D-5L - EQ-5D-5L questionnaire; PQM - Participation Motivation Questionnaire.

Figure 2 – Timeline of the four assessments and testing protocol

2.2. Training Protocol

Subjects in the CG were asked to maintain their daily life routines.

EG follow the prescribed intervention plan as training session took 90 minutes to complete, two sessions per week over 10 months (a total of 80 sessions, hours of training range from 232h to 304h), from March to July and September to March (2018 and 2019). Exercising included aerobic activities (40min), muscle strength (20min), body balance (10min), technical skill (10min) and stretching specific exercises (10 min).

As main target of the training plan, two competitions took place in the 5 countries involved in the project, on the following dates – September 2018 and September 2019.





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3. Results

At baseline, the number of participants were 418, male and female, representing the Games group and the NoGames group (Figure 3).

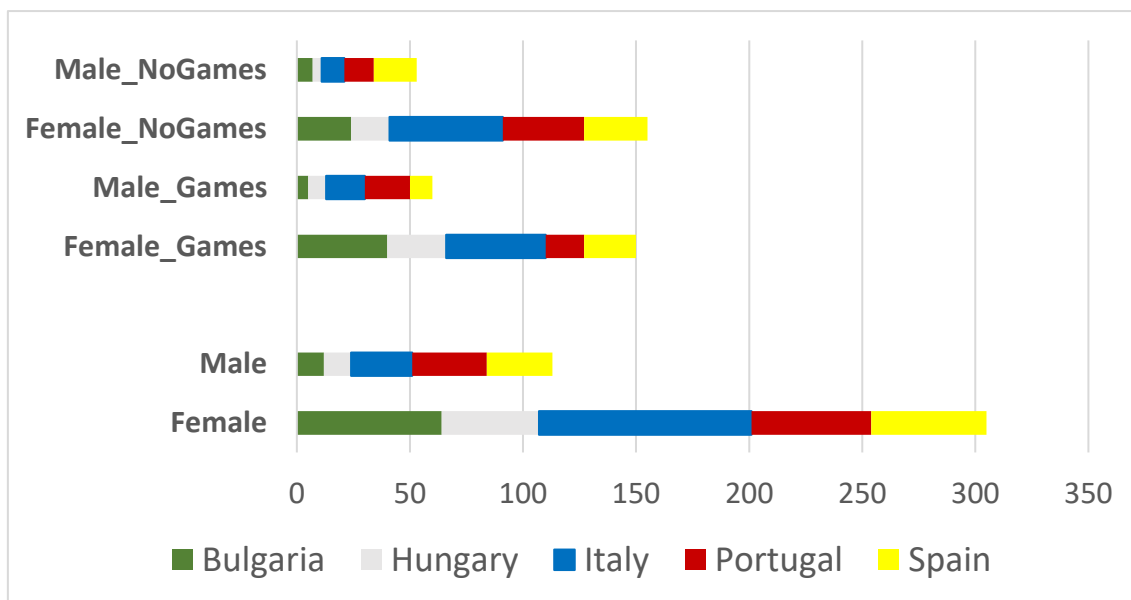


Figure 3- Distribution of the sample (N= 418) by country, gender and games participation, at baseline.

One hundred and forty-eight elders participate actively in the project. The prevalence of female was higher with exception of Portugal and Spain, and the dropout was 7.27%, with a range from 0% to 18.2%.

Sociodemographic and anthropometric characteristics of the participants, by country and sex, at baseline, are presented on the following Figures (4,5,6,7,8).



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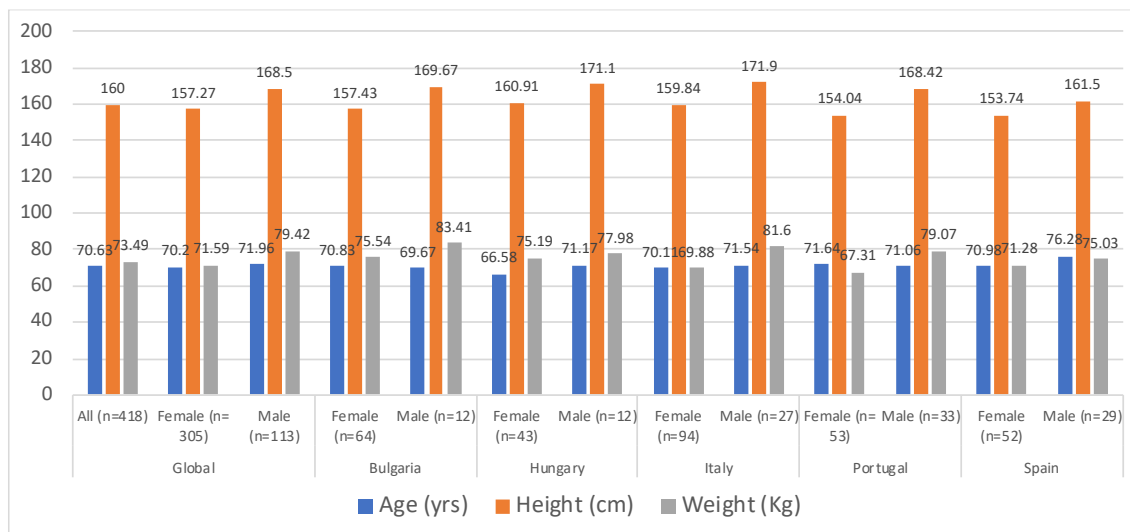


Figure 4- Averaged Age, Height and Weight of the sample by country and sex, at baseline.

Males are higher and heavier than females. In relation to age, they are quite similar.

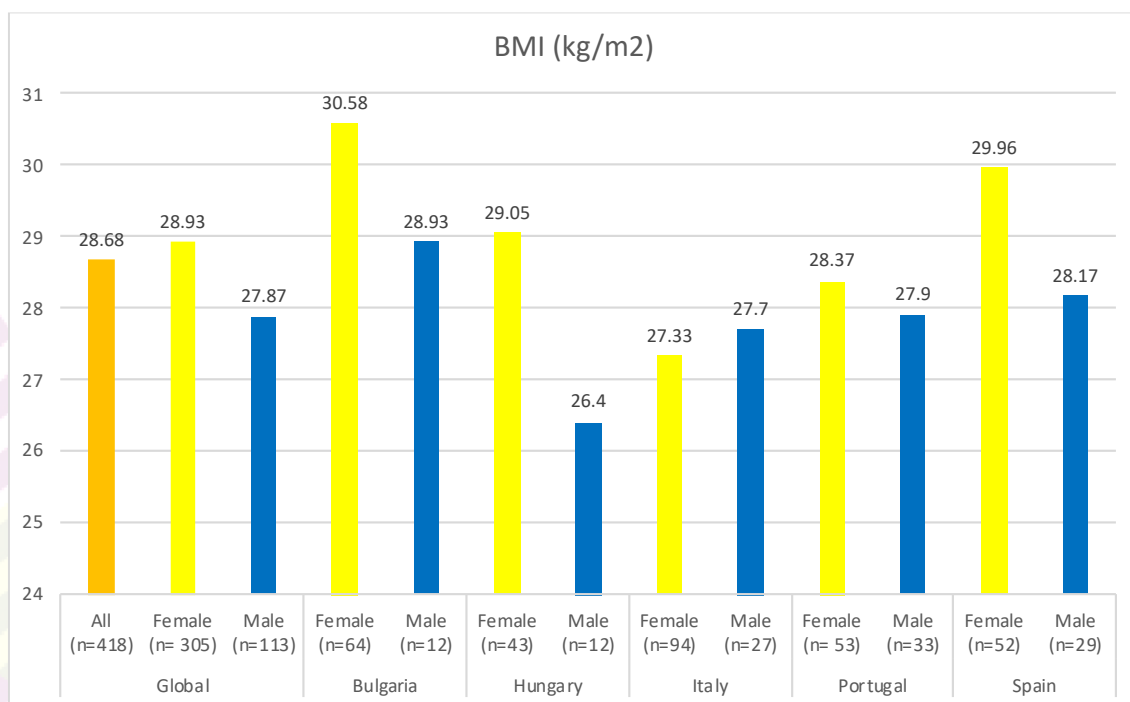


Figure 5- Averaged BMI of the sample by country and sex, at baseline.

In the BMI, an excellent marker for health, female showed higher value than men.



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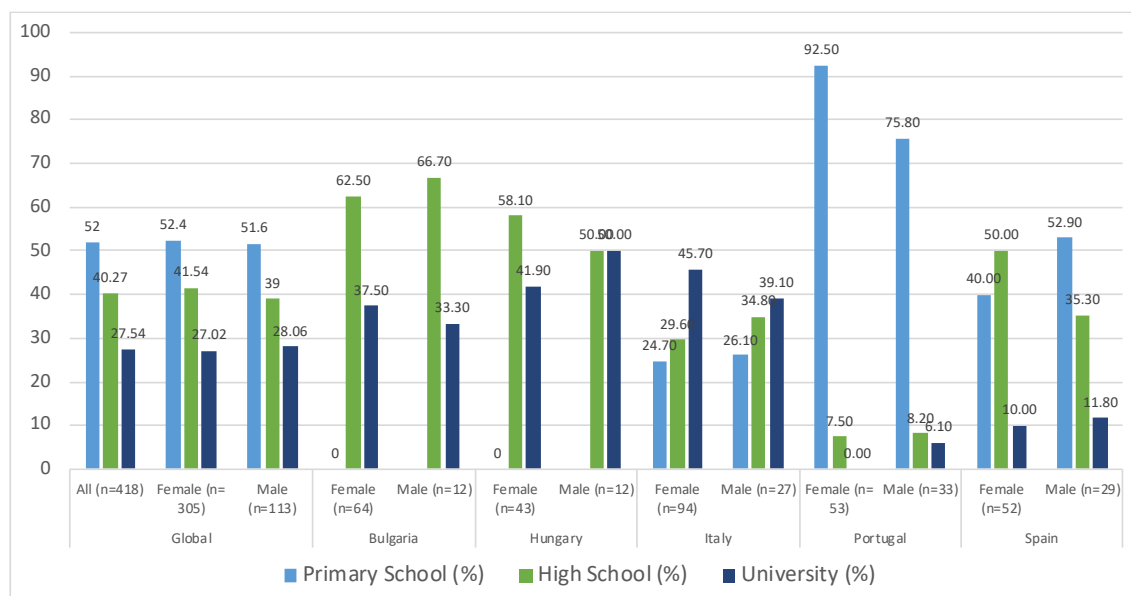


Figure 6- Academic level of the sample by country and sex, at baseline.

In relation to education, academic level, Portugal and Spain presented evident differences from the other countries. In fact, Bulgaria, Hungary and Italy showed high percent of participants with undergraduate level as education. Considering the age-group in study and the European economic-political context at their working-life time, the education, high education, may influence positively the approach to health-life style.

The intervention plan impact on participants was analyzed as the differences from moment 1, baseline, and moment 4, in the all group and by country. Also, to better understand the huge data information, results were presented as anthropometric variables, physical fitness variables and motivation for exercising variables.

The intervention plan related changes on anthropometric variables are presented on Figure 7 and Figure 8.



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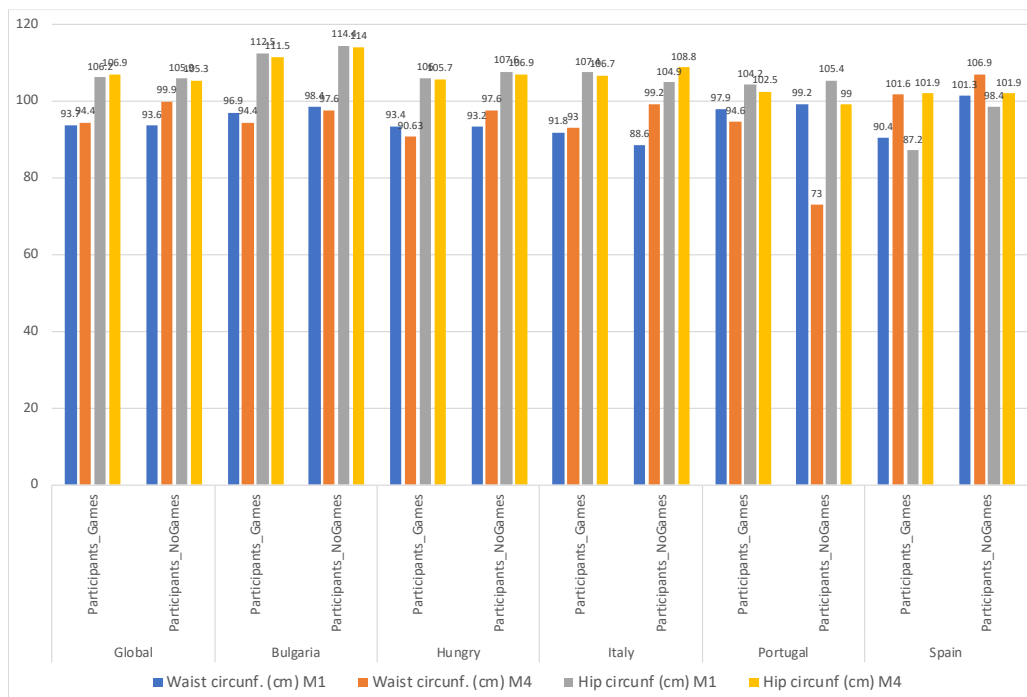


Figure 7- Waist circumference and Hip circumference of the sample by group and country, at moment 1 and moment 4.

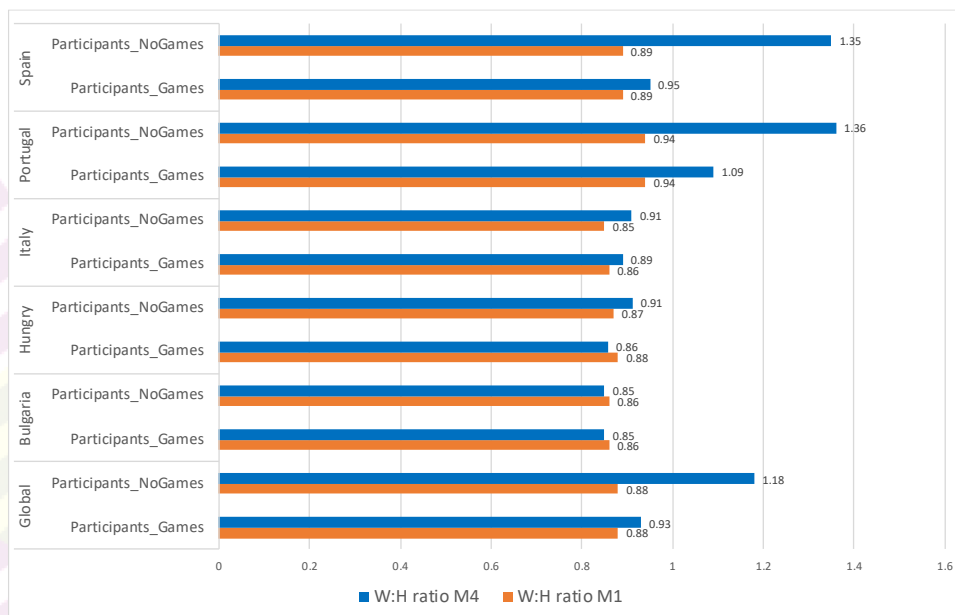


Figure 8- Waist to Hip ratio of the sample by group, at moment 1 and moment 4.

According to record values, participants who enroll the training plan significantly increase the waist to hip ratio (M1 = ,88±,09, M4 = ,93±,12, p < 0.05). Despite having an



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increment the final score is still below the cut line as defined by World Health Organization.

Different situation can be found in nGames group who increase significantly both the waist circumference ($M1 = 93,57 \pm 13,24$, $M4 = 99,96 \pm 11,75$, $p < 0.05$) and the Waist to Hip Ratio ($M1 = ,88 \pm ,09$, $M4 = 1,18 \pm 1,45$, $p < .05$), throughout the two years intervention plan. Both health markers reach important scores and may be at high risk on health condition.

As a consistent pattern, the group enrolled in the games, observed a decreased or a maintenance of the cardiovascular risk factors, as overall obesity and central obesity determinants. The final scores highlight the impact of the intervention plan of aged population life quality.

The intervention plan related changes on physical fitness variables are presented on Figure 9, 10, 11, 12 and 13.

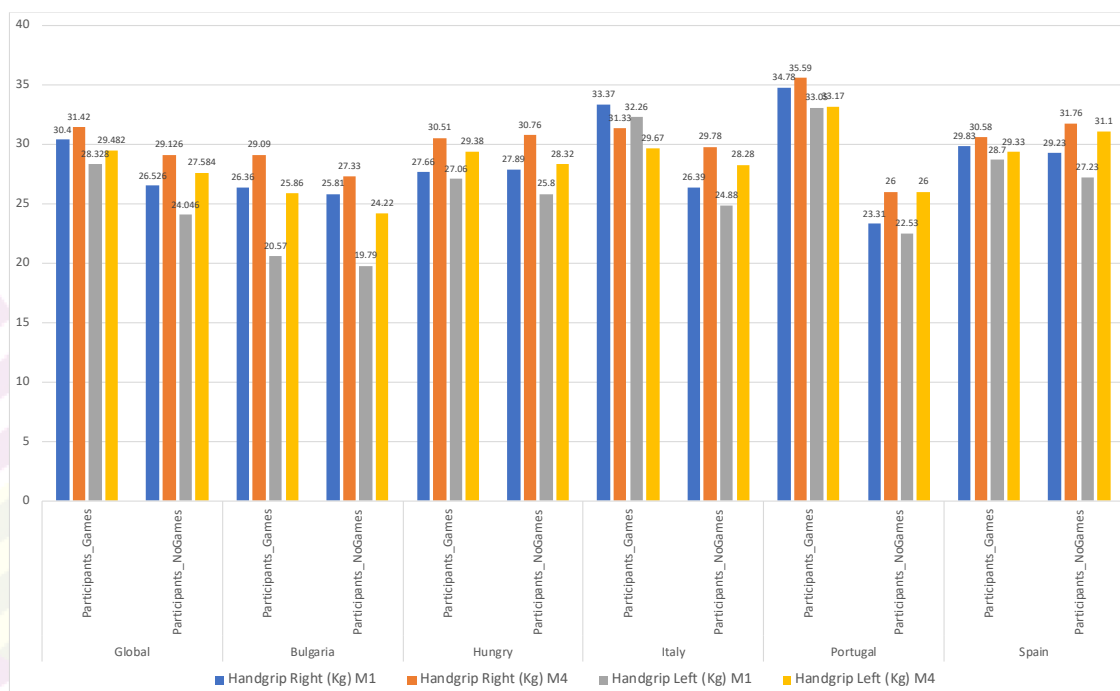


Figure 9 – Left and Right handgrip test of the sample by group and country, at moment 1 and moment 4.



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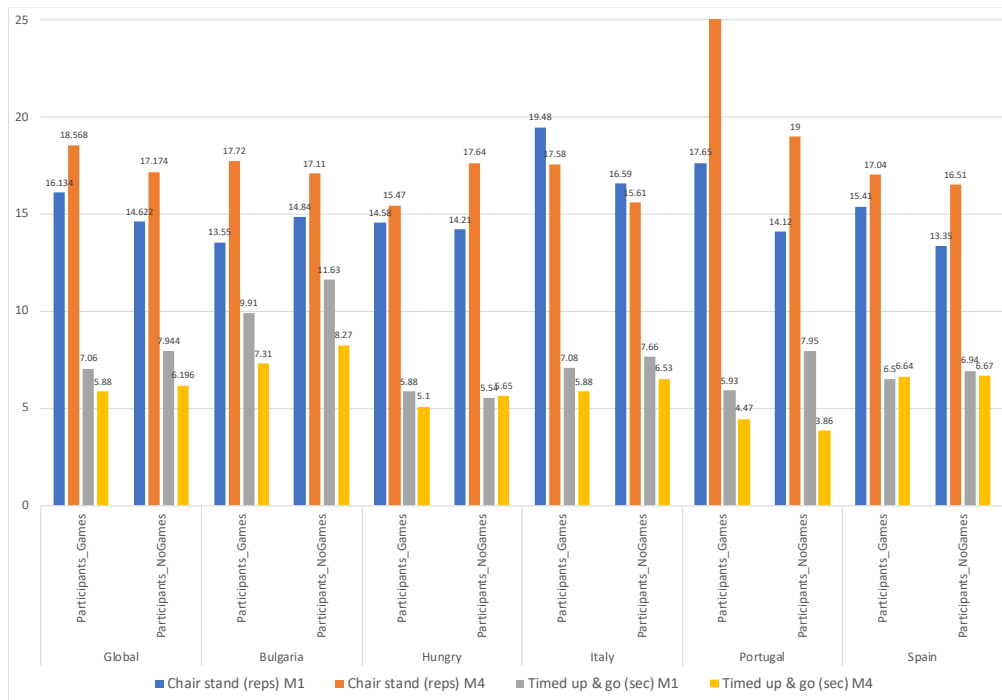


Figure 10 – Chair sit to stand test and Timed Up & Go test of the sample by group and country, at moment 1 and moment 4.

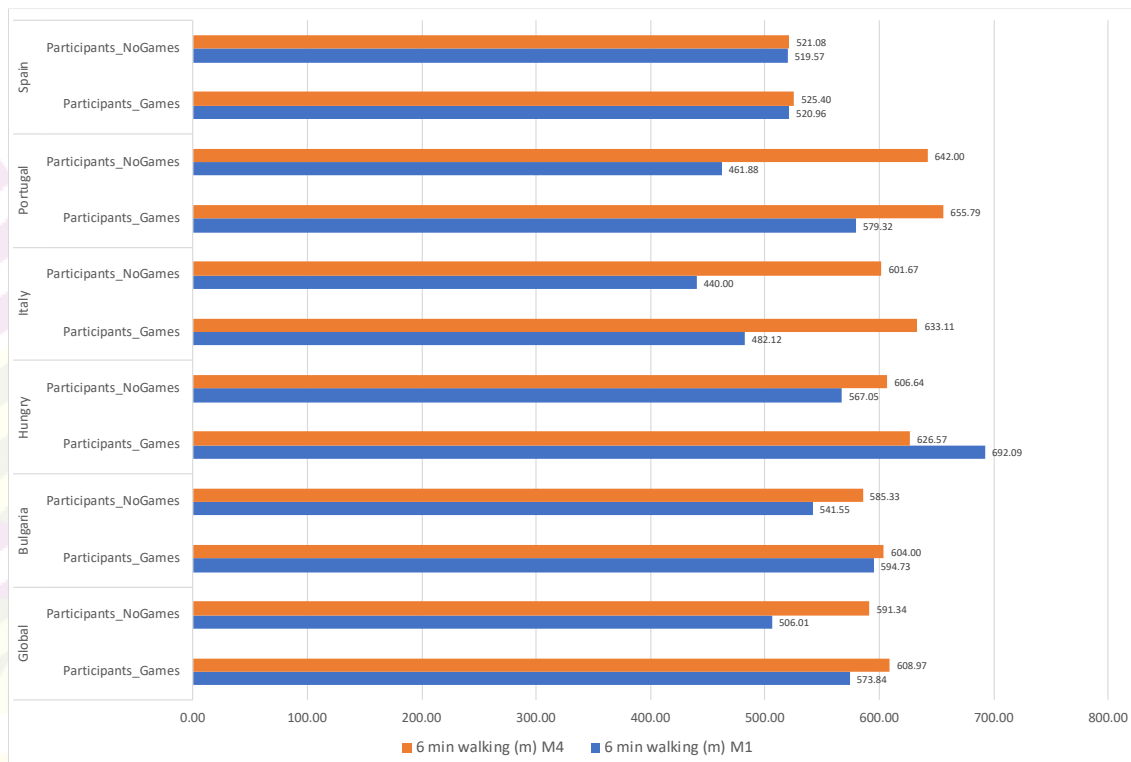


Figure 11 – Six minutes walking test of the sample by group and country, at moment 1 and moment 4.



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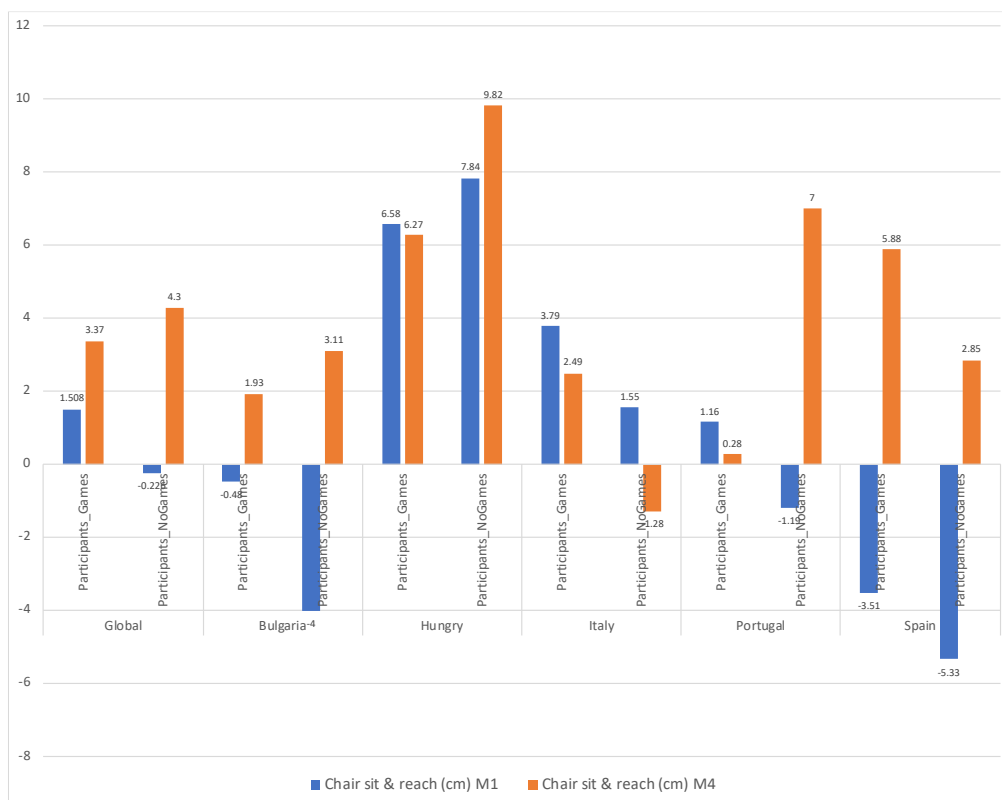


Figure 12 – Chair sit and reach test of the sample by group and country, at moment 1 and moment 4.

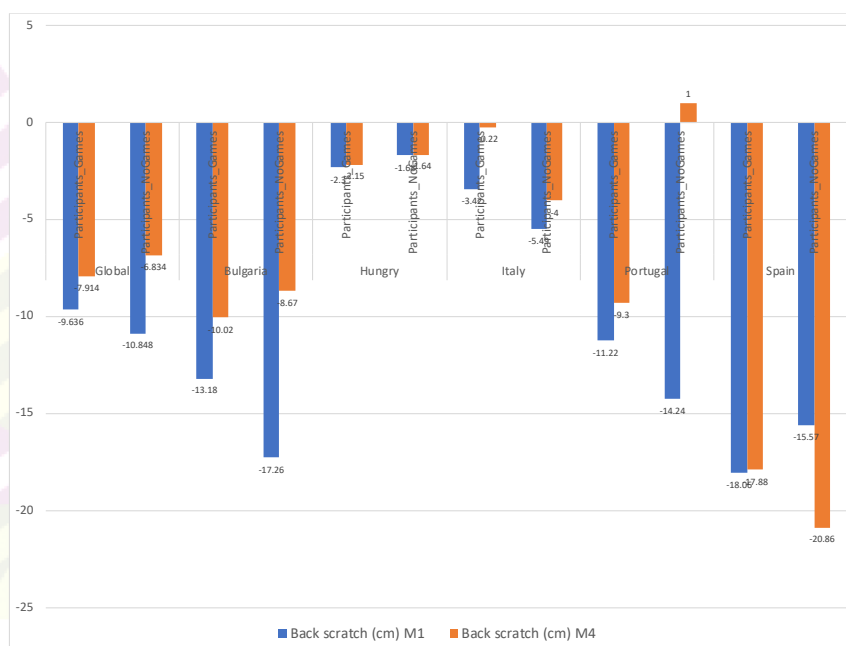


Figure 13 – Back and Scratch test of the sample by group and country, at moment 1 and moment 4.



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The findings showed important changes on lower limb muscle strength, assessed as *Chair to Stand test*, and on cardiorespiratory capacity, assessed as 6 Minutes Walking test. However, the nGames group also reported improvements.

The evidences may indicate that regular physical activity, with or without games intervention plan, has benefits on fitness and life quality.

It was found differences between the involved countries on the final output:

- Bulgaria findings show evident increases on muscle strength and agility but not on stretching test (Chair sit & reach, back scratch).
- Hungary presented an excellent level of physical fitness at that stage. Therefore, the maintenance of such level of physical fitness was the big issue.
- Italy shows important improvements cardiorespiratory capacity and agility. In fact, this group focus the exercise training on recreation games and challenging task. The sessions were running with good dynamic and interaction between participants. Apparently, for future intervention, exercising more the muscle strength is needed.
- The Portuguese group show similar behavior to Italian group. However, future intervention should provide more time and focus on stretching exercises as the agility and movement range seems to be compromised.
- The Spanish group enroll the project in the end of the first year. Also, the participants involved on intervention games have an exercising history for more than 4 years and they are the oldest group. Therefore, in terms of physical fitness little changes were expected on physical fitness. Like Italy, the big challenge for the Spanish group was the attendance and the increase in number of participants.
-

Considering the above reported, the games intervention is effective in promoting physical fitness but not different from other intervention plans. The exercising focus on motor capacities influence directly the more or less increment on physical fitness. The main finding seems to point that in intervention with aged population, a vast array of exercises is needed for a holistic wellbeing.





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Another issue of the present project was to investigate the motivation for exercising or whether competition may promote additional motivation for exercising. The results of the PMQ are reported for all participants on Figure 14 and for all participants, by country.

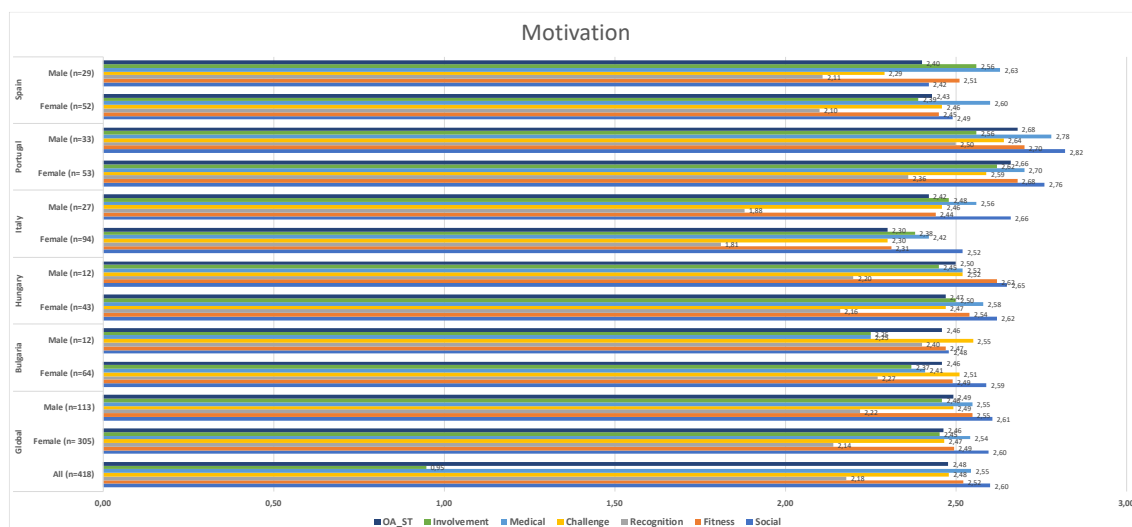


Figure 14 – Participation Motivation Questionnaire of the sample, by country.

Rated from 1 to 3 points, the six questionnaire dimensions initial scores are quite similar among them. Nevertheless, the Dimension Social reach the highest value and Dimension Recognition show the lowest scores, on both participants enrolled on the Games and participants who not enroll the Games. The Games participants reports higher scores, on all dimensions.

According to the findings, it seems that competition, assessed as challenge dimension, was not the main motivation to enroll the games intervention plan, at least more than the other dimensions.

Considering the motivation for exercising by country, the answer’s profile does not change from one to another country. The highest and the lowest scores are still the Dimension Social and the Dimension Recognition, respectively, except Spain. Also, the participants of the nGames group recorded lower scores than their counterparts. Among the Games participants, the Spanish one’s reported the lowest scores and the Dimension Medical as the most important factor for exercising. This finding may be due to Spain group represent the higher age-group on the project.

The life quality, assessed as EQ-5D-5L TEST, follow 5 dimensions - mobility, self-care, usual activities, pain/discomfort and anxiety/depression – and measure the self-rated





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health. Each dimension is divided in 5 levels (1 to 5), indicating "no problems" (level 1) to "extreme problems" (level 5).

The scores obtained in the present study, as a whole and by country, are presented in Figure 15 and 16.

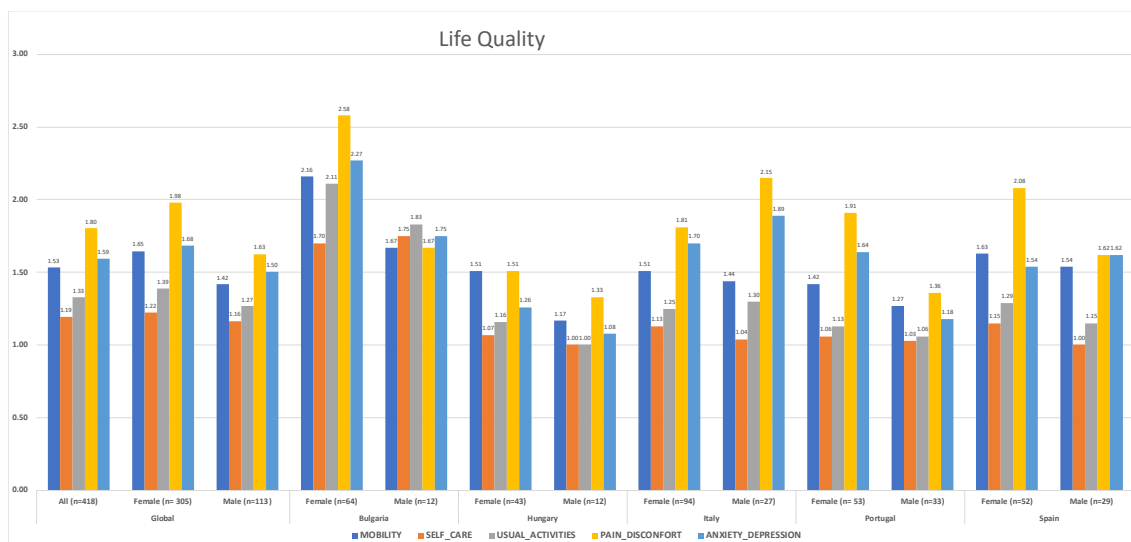


Figure 15 – EQ-5D-5L TEST follow 5 dimensions - mobility, self-care, usual activities, pain/discomfort and anxiety/depression - of the sample by sex and country.

Considering the final scores on both moments, the health state of the participants seems to show no problems or slight problems in all dimensions.

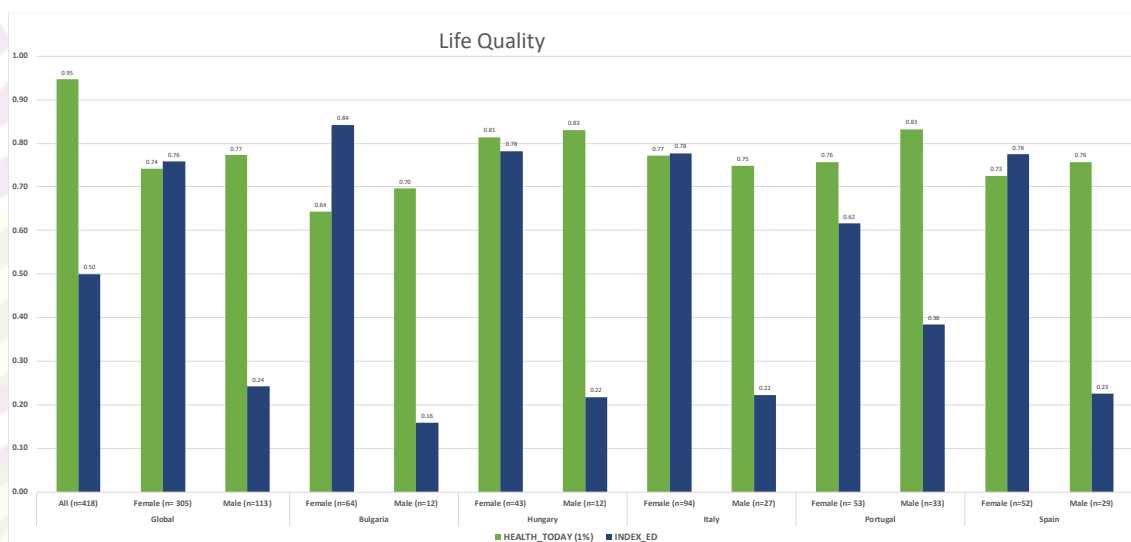


Figure 16 – EQ-5D-5L TEST - Health Today and Index ED - of the sample by sex and country.



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In relation to Index values which inform about the quality-adjusted life years (QALYs), the scores presented values above 0.78. Such values indicate good level of QALYs, meaning satisfactory health care intervention.

Considering the final scores by country, the health state of the participants showed similar behavior to whole sample.

4. Conclusions and evidences

The main finding of the present project is the commitment of the participants, cross country, on exercising for health. In fact, the enrolled participants showed a high systematic assistance (80% mean among countries) to training sessions and the absents/dropout was less than 15%, highlighting the relevance of structured practice, namely among elderly population.

Participants report as main motivation for exercising the social issues.

There was an evident increase on physical fitness and healthy lifestyle among aged population, independently of the country, educational status, sex or age.

The motivation for systematic physical activity exercising is the greatest finding of the project. The participants revealed a high percent of training sessions and events assistance, enjoy and enthusiasm on exercising and health competition. Maybe the competition, the challenge and the important space for promotion of social interaction are the keys for a successful intervention plan.

The scientific findings and the enthusiasm of the aged population in participating on project provide good evidences in developing intervention programs with important impact and low costs.

For future intervention it may be important to consider the increment of weekly session of exercising. We believe that the impact will be more efficient, and it will follow the recent ACSM' guidelines for health in aged population. Also, the intervention must be following the regional and local sport development in order to use the intrinsic motivation for exercising. In this aspect, the traditional games seem to be an excellent start point. Adapted facilities, in terms of accessibility and comfort, may be the difference in linkage for successful intervention plan.



