

Compliance with the recommendations of the World Health Organization on the practice of physical activity in people over 65 years in Spain

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ABSTRACT

Purpose: Identifying whether the recommendations of the WHO regarding the amount of weekly time dedicated to the practice of PA in its different modalities are being met in the population of people over 65 in Spain. Method: This study has used data provided by 1317 interviewees aged 65 to 69 years old included in the Spanish Health Survey. Results: 19.1% of the sample said to not walk any day of the week at least 10 minutes, being the 84.2% those who did, at least, 150 minutes per week. Concerning the accomplishment of intense and moderate physical activity generally, the general or optimal recommendations for the weekly time were not satisfied. The proportion of individuals that comply the recommendations, general and optimal, of physical activity moderate were 17.4% in both cases. Those percentages, regarding intense exercise, the percentage of individuals that comply with the recommendations are reduced to 6.6% and 2.4%, for general and optimal recommendations, respectively. Conclusion: The practice of moderate and intense exercise is not within the frequent habits of people over 65 years of age, and this phenomenon could be one of the causes of the increasing health demand in this country (regardless of whether it is of a sensitive sector to get sick from the ageing process).

Keywords: Public health; Lifestyle; Aging; Walking; Sports.

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INTRODUCTION

Population ageing is a known global phenomenon. In 2029, life expectancy in Spain will be 84 years for men and 88.7 for women. Currently, there are 9,057,193 elderly individuals in this country, representing 19.4% of the total population (Statistics National Institute, 2020).

The state budget items of all developed countries dedicated to the diagnosis and treatment of diseases increase due to the growth of the population in general; and, due to the ageing of the same, in particular (due to the increase in life expectancy and reduction in the birth rate) (Beard, Officer, & Cassels, 2016). So, reducing the socio-economic burden of the most prevalent diseases and comorbidities and implementing measures that help their prevention have become critical points of action by health authorities (Bagrichevsky & dos Santos, 2018; Rodulfo, 2019).

Among the many benefits that physical activity (PA) provides is the improvement of the general state of health through the delay of the physiological process of ageing; It helps in the treatment and rehabilitation of diseases, as well as their prevention. In addition, PA has the ability to be individualized to the characteristics and needs of each person, and this aspect is especially important for the elderly (del Pilar et al., 2017).

However, the term PA must be conceptualized, which historically has included any body movement produced by muscle-skeletal contraction and, consequently, increases energy expenditure, regardless of its duration and intensity (Howley, 2001). Along these lines, the World Health Organization defined a series of recommendations regarding the adequate duration and intensity of PA for maintaining healthy lifestyle habits, improving cardiorespiratory and muscular functions, and bone and functional health, and reduce the risk of non-communicable diseases, depression and cognitive decline (World Health Organization, 2010). Among others, these recommendations include that: (a) as general advice, perform moderate PA at least 150 minutes weekly or vigorous for 75 minutes (or a combination of both); (b) as optimal advice, practice moderate PA 300 minutes weekly or vigorous for 150 minutes (or a combination of both); (c) the periods of AP to be taken into account and that may be part of the final weekly calculation must last at least 10 minutes; (d) when older adults cannot perform the recommended PA due to their health status, they will remain physically active to the extent that their condition allows (such as walking 150 minutes a week) (World Health Organization, 2010).

Taking all of the above into account, and that there is no evidence to indicate the degree of compliance with the aforementioned recommendations; this study was carried out with the aim of identifying whether the recommendations of the WHO regarding the amount of weekly time dedicated to the practice of PA in its different modalities are being met in the population of people over 65 in Spain.

MATERIALS AND METHODS

Participants

This study has used data provided by 1317 interviewees aged 65 to 69 years old. Of the total sample included in the Spanish Health Survey (SHS), individuals younger than 65 years old were excluded as they are not the object of study of this research. Older than 70 years old were also excluded due to the fact that they are not asked about their physical activity levels.

Of the total sample, 46.9% were males and 53.1% were females and the average age was 67.5 ± 1.1 years old.

Measures

The following dependent variables were considered:

Weekly walking minutes (WALK)

This continuous variable corresponds to the minutes the person walks regularly through the week (including only those bouts that were at least 10 minutes long). It was calculated from the number of days the subject walks, multiplied by the time (in minutes) that those sessions usually take.

Walking recommendation accomplishment (RWALK)

This dichotomous variable describes if the subject accomplishes or not the minimum walking recommendation (150 minutes/week).

Weekly minutes of moderate PA (PAMOD)

This variable shows the total amount of time in minutes of moderate PA the interviewee does. It was calculated from the weekly number of days of PA multiplied by the time (in minutes) that those sessions usually take.

General PA recommendation accomplishment (RPAMOD)

This dichotomous variable describes if the interviewee complies or not with the weekly moderate PA levels recommended (150 minutes/week).

Compliance with optimal levels of moderate PA (OPAMOD)

This dichotomous variable describes if the interviewee complies or not with the weekly optimal levels of moderate PA recommended (300 minutes/week).

Weekly minutes of intense PA (PAINT)

This variable registers the total amount of time in minutes of intense PA. It was calculated from the weekly number of days of intense PA multiplied by the times (in minutes) that those sessions usually take.

Compliance with general levels of recommended intense PA (RPAINT)

This dichotomous variable describes if the interviewee complies or not with the weekly recommended intense PA levels (75 minutes/week).

Compliance with optimal levels of intense PA (OPAINT)

This dichotomous variable describes if the interviewee complies or not with the weekly optimal levels of intense PA recommended (150 minutes/week).

Compliance with at least one of the general PA recommendations (RPA1)

This variable register if the interviewee complies or not with at least one of the two PA recommendations, either moderate or intense.

Compliance with at least one of the optimal PA recommendations (OPA1)

This variable register if the interviewee complies or not with at least one of the two optimal PA recommendations, either moderate or intense.

The study independent variables were: (a) sex; (b) age (years); (c) weight (kg); (d) Body Mass Index (BMI) (kg/m²), calculated from the self-reported weight and height, this variable was divided into five categories:

infra-weight, normal weight, overweight and obesity. These categories were made following the recommendations of the World Obesity Federation (Cole, Flegal, Nicholls, & Jackson, 2007).

Procedures

This empirical study was based on data drawn from the 2017 Spanish National Health Survey (2017) conducted by Statistics National Institute and the Ministry of Health, Consumer Affairs and Social Welfare of the Spanish Government. The survey was developed by systematic sampling and equiprobability of being selected on their census records from 37500 homes across the country between October of 2016 and October of 2017.

This study was conducted on an unidentified publicly available dataset, with all data kept anonymous. According to Spanish legislation, it was not necessary to obtain the approval of an ethics committee.

Analysis

To characterize the sample descriptive measures were taken (frequencies, percentages, mean, standard deviation and 95% confidence interval). The proportion test chi-square was used to perform tests on the equality of proportions using large. Observations with missing values were dropped automatically by the statistical software.

T-tests were used to determine differences among genders for continuous variables. Pearson's test was performed to assess correlations between the continuous dependent variables.

All statistical analysis was made with Stata for MAC, version 12. Statistical significance was always set a value of $p < .05$.

RESULTS

Sample's characteristics

The study population consisted of 1317 interviews from individuals aged between 65 and 69 years old. Of those, 46.9% were males and 53.1% were females. The average age within the sample was 67.5 ± 1.1 years old. Participants have shown overweight overall and split by sex (Table 1). No significant differences were found between genders on their BMI ($p = .4$).

Table 1. Descriptive statistics of the study sample [data provided: mean \pm standard deviation (95% confidence interval)].

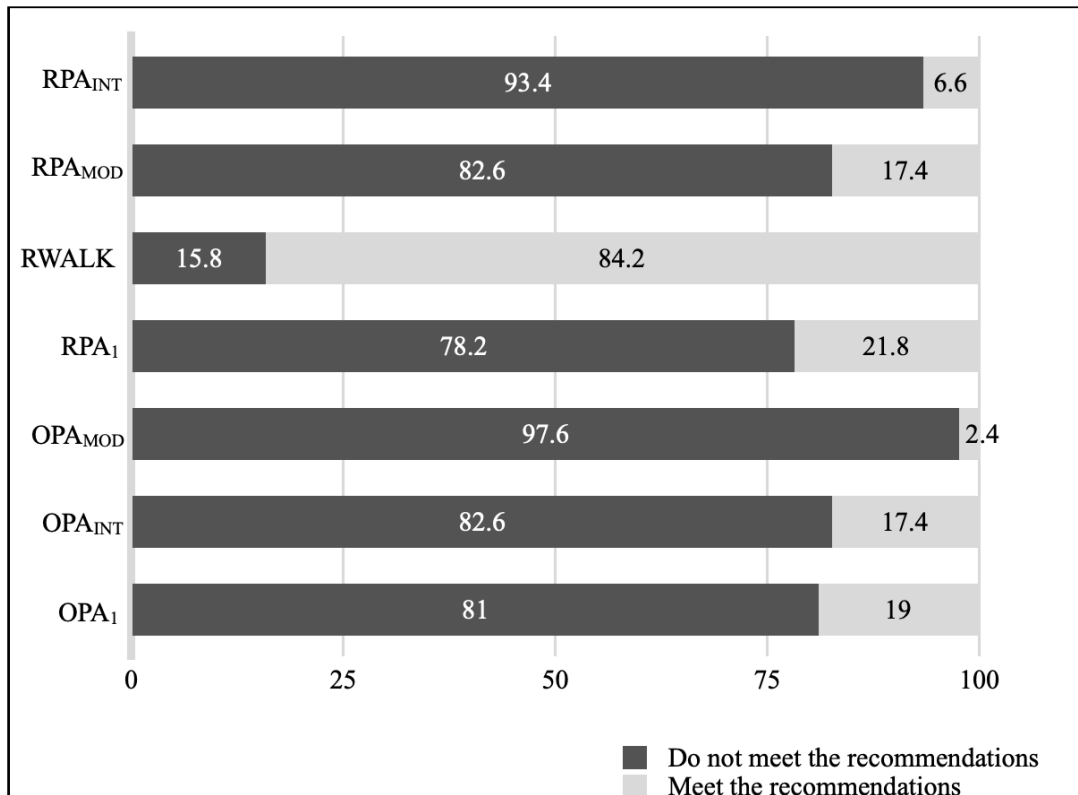
	All (n = 1317)	Men (n = 618)
Age (years)	67.5 \pm 1.1 (67.4-67.6)	67.5 \pm 1.1 (67.4-67.6)
Weight (kg)	74.6 \pm 13.4 (73.9-75.3)	80.3 \pm 12** (79.4-81.2)
Height (cm)	164.3 \pm 8.4 (164-165)	170.1 \pm 6.2** (170-171)
BMI (kg/m ²)	27.6 \pm 4.6 (27.4-27.8)	27.7 \pm 3.9* (27.4-28)

BMI: body mass index. * $p < .05$, t-test; ** $p < .01$, t-test.

PA recommendation accomplishment

Regarding the walking habit, 19.1% of the sample said to not walk any day of the week at least 10 minutes, being the 84.2% those who did, at least, 150 minutes per week. No statistical differences were found among men and women for this variable ($p = .2$).

Concerning the accomplishment of RPA_{MOD} , RPA_{INT} , OPA_{MOD} , OPA_{INT} , generally, the general or optimal recommendations for the weekly time were not satisfied. The proportion of individuals that comply RPA_{MOD} y OPA_{MOD} were 17.4% in both cases (Figure 1). Those percentages, regarding intense PA, the percentage of individuals that comply with the WHO recommendations are reduced to 6.6% and 2.4%, for RPA_{INT} and OPA_{INT} , respectively. Recommendations were significant differences were found among men and women are: RPA_{MOD} ($p = .007$), OPA_{MOD} ($p = .007$), $RWALK$ ($p = .04$). Regarding the proportion among both sexes accomplishing the RPA_{MOD} , we found 55% of them being males and 45% females. However, looking at the sex-specific analysis of $RWALK$, the proportion of females were higher, being 51.8% (and 48.2% left the males proportion).



RPA_{INT} : Compliance with general levels of recommended intense PA; RPA_{MOD} : Compliance with general levels of recommended moderate PA; $RWALK$: Walking recommendation accomplishment; RPA_1 : Compliance with at least one of the general PA recommendations; OPA_{MOD} : Compliance with optimal levels of moderate PA; OPA_{INT} : Compliance with optimal levels of intense PA; OPA_1 : Compliance with at least one of the optimal PA recommendations.

Figure 1. Proportion of accomplishment of physical activity recommendations by sex.

On the variables that measure the accomplishment of, at least, one of the recommendations of PA differences among sexes were found both for general recommendations ($p = .016$) and for optimal recommendations ($p = .001$). From 53.3% of the individuals that accomplish at least one of the PA recommendations were males, being the 46.7% left the proportion corresponding to females. Of those who comply at least one recommendation of optimal PA, the difference is slightly higher, being 56% males and 44% females.

Weekly amount of PA

For all the sample, the total amount of minutes of PA_{INT} is 353 ± 449.4 , PA_{MOD} is 367 ± 390.3 and for $WALK$ is 485.3 ± 440.3 minutes. The individualized analysis for each of the sexes has shown that for all the three

PA intensity options the time spent is notably higher by men than by women, being statistically significant the differences between the variables PA_{MOD} and WALK (Table 2).

Table 2. Weekly minutes dedicated to the different PA modalities and intensities [data given mean \pm standard deviation (95% confidence interval)].

	All (n = 1317)	Men (n = 618)
WALK	485.3 \pm 440.3 (462 - 509)	545.3 \pm 474.1** (503 - 587)
PA _{MOD}	89.7 \pm 249.1 (76.2 - 103)	115 \pm 288* (92.3 - 138)
PA _{INT}	24.9 \pm 149.3 (16.8 - 33)	30.3 \pm 174.6 (16.5 - 44.1)

WALK: minutes that usually walks each week; PAMOD: minutes spent performing moderate PA; PAINT: minutes spent performing intense PA. * $p < .01$, t-test; ** $p < .0001$, t-test.

DISCUSSION

This study was carried out with the objective of identifying if the recommendations of the PA practice in its different intensity modalities (low, moderate, and high) are being met in the elderly population of Spain. After analysing the results obtained, it has been identified that the Spanish population between 65 and 70 years of age does not meet the recommended levels at a general or optimal level.

The only healthy recommendation on PA practice that is widely followed is to maintain 150 minutes of walking a week. Walking is essential for maintaining the necessary functionality to carry out the activities of daily life and the quality of life of the elderly (Studenski et al., 2011; Zheng, Xia, Zhou, Tao, & Chen, 2016). Taking the habit of walking or taking long walks can help physically inactive populations to change their PA profile to a more active style. In addition, walking is a viable way to get to or from sites, which contributes significantly to the total amount of daily PA (Menezes, dos-Santos-Silva, Tribess, Romo-Pérez, & Virtuoso-Júnior, 2015). On the contrary, if it represents the only BP performed, it does not ensure the maintenance of healthy cardiovascular parameters (Monteagudo, Cordellat, & Roldán, 2019) nor does it imply enough impact to slow down processes associated with ageing such as sarcopenia and osteoporosis (Daly, 2017). Benefits obtained with vigorous strength training, the development of activities that force the cardiovascular system to function outside its comfort zone (Aragao-Santos et al., 2019; Sardeli et al., 2017).

Regarding the practice of intense and moderate PA, the proportion of individuals that complies with at least one of the general recommendations is below 20%. This phenomenon indicates, among other aspects, the lack of awareness in the elderly population about the importance of maintaining healthy lifestyle habits. This may be because said population sector was born between 1946 and 1951 in a historical context of post-war and economic shortages. Consequently, only 16.9% of this population group has higher education; compared to 44.8% who only passed elementary studies (Ministry of Health, Consumer Affairs and Social Welfare, 2020). These data are in agreement with the correlation widely documented in previous research regarding greater knowledge about healthy lifestyle habits and greater sensitivity and awareness of the impact these have on the quality of life among the population with the highest educational level. Thus, in terms of Public Health, general education functions as a “social vaccine” that saves large amounts of money for health systems (Baker et al., 2017).

From the individualized analysis by sex, it is noteworthy how the PA recommendations are still further from being reached if only the sample subgroup of women is considered. To analyse this finding, the gender perspective and the social roles differentiated by sex must be considered. Biological factors intervene in the maintenance of health and the development of diseases in men and women: hereditary, congenital, and/or

physiological (Leirós-Rodríguez, Romo-Pérez, García-Soidán, & Soto-Rodríguez, 2018). These differences are the ones referred to by the "morbidity paradox" that identifies and recognizes the greater life expectancy of women but with a worse quality of life and a worse general state of health due to socioeconomic factors (women appear in the statistics with a higher risk of poverty), cultural (the index of women between 65 and 70 with higher education is 12.7% compared to 21% of men) and social (women have traditionally prioritized tasks of care to third parties over their own) (Castañeda-Abascal, 2014; Ministry of Health, Consumer Affairs and Social Welfare, 2020; Nelson, 2016).

Parallel to the association between lower educational level and worse healthy habits, it should be noted that another possible cause of less adherence to PA practice in this population group may be the existence of comorbidities and chronic diseases that may: (a) limit or even contraindicate PA practice; or (b) act as a self-limiting factor by generating fear of worsening the clinical picture (Porras, Stafford, & Adams, 2018). Whatever the explanation, to reduce its impact, specific action is required by PA and Sports graduates and the health professionals with the greatest knowledge in this area (physical therapists and sports doctors). These professionals should be in charge of putting Public Health policies into practice because they have the most knowledge about PA practice and the most confidence they can transmit to users about the safety and adequacy of exercise guidelines without risk for their health. Furthermore, they are the only professionals trained to adapt PA recommendations to individual considerations such as the presence of respiratory, metabolic, vascular or even neoplastic diseases (all of them already known beneficiaries of the practice of PA) (Kokkinos & Myers, 2019; Racodon, Peze, & Masson, 2019; van Blarigan et al., 2018).

At the same time, the existence of comorbidities or chronic diseases could also explain the lower prevalence of adequate PA levels among women. Previous research on dependency and functionality in older people has identified that levels of frailty and general health are worse in women (Collard, Boter, Schoevers, & Oude-Voshaar, 2012). Although several factors contribute to health-related loss of quality of life, a very serious determinant is the deterioration of functionality (Gómez-Piriz, Puga-González, Jurado-Gilabert, & Pérez-Duque, 2014; Leirós-Rodríguez, Romo-Pérez, Soto-Rodríguez, & García-Soidán, 2018). However, it remains to be determined which of the two phenomena (loss of functionality and quality of life and acquisition of sedentary habits) is the cause and which is a consequence. However, in both cases, the solution lies in improving both factors that, in practice, act by feedback.

For all the aforementioned, the strategic lines of action in the field of Public Health must emphasize its messages and interventions on the acquisition of healthy lifestyle habits of the population: physical activity and food fundamentally. To achieve this, once the current scenario is presented, in which scientific evidence is available on the numerous and profound benefits of moderate and intense BP, but this knowledge is not reflected in the lifestyle of the population, the health authorities should change the economic paradigm of "cost-benefit" of their policies and interventions to one in which the impact and social impact of messages are taken as a measure of effectiveness (Phelps et al., 2016). In this way, in the short term, the balance "spending-saving" at the economic level may not be as positive; however, in the medium and long term, it will be.

This study has limitations that must be recognized. First, self-reported information on the amount of PA performed was used instead of using accelerometers or pedometers that allowed its objective quantification. Secondly, the exclusively Spanish population limits the generalization of our results to other countries. Third, this study did not include institutionalized older people in community residences or dwellings, although it is possible that the results obtained would have been strengthened if those participants had been included.

Fourth, no other physical tests were performed simultaneously, such as strength or endurance tests, which could corroborate and extend the results obtained.

Despite these limitations, there are also significant strengths. This is a population-based study whose sample was not selected based on the state of physical health or degree of functional limitation. This study is the first to confirm, with representative data from the total population of older Spanish people, the low social impact of healthy PA practice recommendations among Spanish elderly.

CONCLUSIONS

The WHO recommendations on recommended PA levels for health maintenance among older people are not being carried out by the Spanish population. The practice of moderate and intense exercise is not within the frequent habits of people over 65 years of age, and this phenomenon could be one of the causes of the increasing health demand in this country (regardless of whether it is of a sensitive sector to get sick from the ageing process).

Identify the reasons why these people are not joining moderate and intense PA programs, such as lack of advice and guidance on good practice, fear of harm, little social support and lack of supply of adequate facilities; they must be identified and corrected as soon as possible.

In addition, as a target population to act on, the new measures to be implemented should have a special objective for women since their behaviour in relation to the practice of PA is much less recommended than that of their male counterparts.

AUTHOR CONTRIBUTIONS

All authors (BBA, RLR, JLGS) performed the measurements, and were involved in planning and supervised the work, processed the experimental data and its analysis, drafted the manuscript, designed tables and figures, aided in interpreting the results and worked on the manuscript, discussed the results and commented on the manuscript.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

- Aragao-Santos, J. C., de Resende-Neto, A. G., Nogueira, A. C., Feitosa-Neta, M. L., Brandao, L. H., Chaves, L. M., & da Silva-Grigoletto, M. E. (2019). The effects of functional and traditional strength training on different strength parameters of elderly women: A randomized and controlled trial. *The Journal of Sports Medicine and Physical Fitness*, 59(3), 380-386. <https://doi.org/10.23736/S0022-4707.18.08227-0>

- Bagrichevsky, M., & dos Santos, D. S. (2018). "Shameless" sedentarism: Individual responsibility for health? *Psychology*, 9(4), 760-772. <https://doi.org/10.4236/psych.2018.94048>
- Baker, D. P., Smith, W. C., Muñoz, I. G., Jeon, H., Fu, T., Leon, J., ... Horvatek, R. (2017). The population education transition curve: Education gradients across population exposure to new health risks. *Demography*, 54(5), 1873-1895. <https://doi.org/10.1007/s13524-017-0608-9>
- Beard, J. R., Officer, A., Araujo, I., Sadana, R., Margriet, A., Michel, J. P., ... Chatterji, S. (2016). The world report on ageing and health: A policy framework for healthy ageing. *The Lancet*, 21(387), 2145-2154. [https://doi.org/10.1016/S0140-6736\(15\)00516-4](https://doi.org/10.1016/S0140-6736(15)00516-4)
- Castañeda-Abascal, I. E. (2014). The theoretical framework in health research with gender approach. *Revista Cubana De Salud Pública*, 40(2), 249-257.
- Cole, T. J., Flegal, K. M., Nicholls, D., & Jackson, A. A. (2007). Body mass index cut offs to define thinness in children and adolescents: International survey. *British Medical Journal (Clinical Research Ed.)*, 335(7612), 194. <https://doi.org/10.1136/bmj.39238.399444.55>
- Collard, R. M., Boter, H., Schoevers, R. A., & Oude Voshaar, R. C. (2012). Prevalence of frailty in Community-Dwelling older persons: A systematic review. *Journal of the American Geriatrics Society*, 60(8), 1487-1492. <https://doi.org/10.1111/j.1532-5415.2012.04054.x>
- Daly, R. (2017). Exercise and nutritional approaches to prevent frail bones, falls and fractures: An update. *Climacteric*, 20(2), 119-124. <https://doi.org/10.1080/13697137.2017.1286890>
- del Pilar, M., Aguilar-Parra, J. M., López-Liria, R., Rocamora-Pérez, P., Vargas-Muñoz, M. E., & Padilla-Góngora, D. (2017). Skills for successful ageing in the elderly: Education, well-being and health. *Procedia-Social and Behavioral Sciences*, 237, 986-991. <https://doi.org/10.1016/j.sbspro.2017.02.140>
- Gómez-Piriz, P. T., Puga-González, E., Jurado-Gilabert, R. M., & Pérez-Duque, P. (2014). Perceived quality of life and the specific physical activities by the elderly. *Revista Internacional De Medicina Y Ciencias De La Actividad Física Y El Deporte*, 14(54), 227-242.
- Howley, E. T. (2001). Type of activity: Resistance, aerobic and leisure versus occupational physical activity. *Medicine & Science in Sports & Exercise*, 33(6), S364-S369. <https://doi.org/10.1097/00005768-200106001-00005>
- Kokkinos, P., & Myers, J. (2019). Physical activity, cardiorespiratory fitness, and health: A historical perspective. In: Kokkinos, P., & Narayan, P. (eds.) *Cardiorespiratory fitness in cardiometabolic diseases* (pp. 1-9). New York, United States: Springer. https://doi.org/10.1007/978-3-030-04816-7_1
- Leirós-Rodríguez, R., Romo-Pérez, V., García-Soidán, J. L., & Soto-Rodríguez, A. (2018). Prevalence and factors associated with functional limitations during aging in a representative sample of spanish population. *Physical & Occupational Therapy in Geriatrics*, 36(2-3), 156-167. <https://doi.org/10.1080/02703181.2018.1449163>
- Leirós-Rodríguez, R., Romo-Pérez, V., Soto-Rodríguez, A., & García-Soidán, J. L. (2018). Prevalence of functional limitations during aging in a representative sample of spanish population and its relationship with body mass index. *Retos-Nuevas Tendencias En Educacion Fisica Deporte Y Recreación*, (34), 200-204.
- Menezes, A. S., dos Santos-Silva, R. J., Tribess, S., Romo-Pérez, V., & Virtuoso-Júnior, J. S. (2015). Physical inactivity and associated factors in elderly people in Brazil. *Revista Internacional De Medicina Y Ciencias De La Actividad Física Y El Deporte*, 15(60), 773-784. <https://doi.org/10.15366/rimcafd2015.60.010>
- Ministry of Health, Consumer Affairs and Social Welfare. (2020). Statistics National Institute. Retrieved from: <https://www.ine.es/dynt3/inebase/index.htm?padre=979&capsel=979>
- Monteagudo, P., Cordellat, A., & Roldán, A. (2019). Effects of multicomponent exercise on metabolic health parameters in elderly. *MOJ Sports Med*, 3(3), 70-74.

- Nelson, M. K. (2016). Family day care providers: Dilemmas of daily practice. In: Nakano, E., Chang, G., & Forcey, L. R. (eds.) *Mothering: Ideology, experience, and agency* (pp. 181-209). London, England: Routledge. <https://doi.org/10.4324/9781315538891-9>
- Phelps, C., Madhavan, G., Rappuoli, R., Levin, S., Shortliffe, E., & Colwell, R. (2016). Strategic planning in population health and public health practice: A call to action for higher education. *The Milbank Quarterly*, 94(1), 109-125. <https://doi.org/10.1111/1468-0009.12182>
- Porras, L., Stafford, H., & Adams, N. S. (2018). Promoting physical activity. In: Daaleman, T. P., & Helton, M. R. (eds.) *Chronic illness care: Principles and practice* (pp. 55-69). New York, United States: Springer. https://doi.org/10.1007/978-3-319-71812-5_5
- Racodon, M., Peze, T., & Masson, P. (2019). Analysis of physical exercise in cardiac patients following cardiovascular rehabilitation. *Acta Cardiologica*, 17, 1-6. <https://doi.org/10.1080/00015385.2019.1639269>
- Rodulfo, J. I. A. (2019). Sedentarism, a disease from XXI Century. *Clínica E Investigación En Arteriosclerosis (English Edition)*, 31(5), 233-240. <https://doi.org/10.1016/j.arteri.2019.04.004>
- Sardeli, A. V., do Carmo-Santos, L., Ferreira, M. L. V., Gáspari, A. F., Rodrigues, B., Cavaglieri, C. R., & Chacon-Mikahil, M. P. T. (2017). Cardiovascular responses to different resistance exercise protocols in elderly. *International Journal of Sports Medicine*, 38(12), 928-936. <https://doi.org/10.1055/s-0043-115737>
- Statistics National Institute. (2020). Health National Survey. Retrieved from: <https://www.mscbs.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2017.htm>
- Studenski, S., Perera, S., Patel, K., Rosano, C., Faulkner, K., Inzitari, M., ... Connor, E. B. (2011). Gait speed and survival in older adults. *Jama*, 305(1), 50-58. <https://doi.org/10.1001/jama.2010.1923>
- van Blarigan, E. L., Fuchs, C. S., Niedzwiecki, D., Zhang, S., Saltz, L. B., Mayer, R. J., ... Benson, A. (2018). Association of survival with adherence to the American Cancer Society nutrition and physical activity guidelines for cancer survivors after colon cancer diagnosis: The CALGB 89803/alliance trial. *JAMA Oncology*, 4(6), 783-790. <https://doi.org/10.1001/jamaoncol.2018.0126>
- World Health Organization. (2010). *Global recommendations on physical activity for health*. World Health Organization. Geneva, Switzerland: World Health Organization.
- Zheng, G., Xia, R., Zhou, W., Tao, J., & Chen, L. (2016). Aerobic exercise ameliorates cognitive function in older adults with mild cognitive impairment: A systematic review and meta-analysis of randomised controlled trials. *British Journal of Sports Medicine*, 50(23), 1443-1450. <https://doi.org/10.1136/bjsports-2015-095699>

