

Lera-López, F.; Garrues Irisarri, Mirian A.; Ollo-López, A.; Sánchez Iriso, E.; Cabasés Hita, J.M. y Sánchez Santos, J.M. (2017) Actividad física y salud autopercebida en personas mayores de 50 años / Physical Activity and Self-Perceived Health among People Aged 50 and Over. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 17 (67) pp. 559-571. [Http://cdeporte.rediris.es/revista/revista67/artactividad835.htm](http://cdeporte.rediris.es/revista/revista67/artactividad835.htm)

DOI: <https://doi.org/10.15366/rimcafd2017.67.011>

ORIGINAL

PHYSICAL ACTIVITY AND SELF-PERCEIVED HEALTH AMONG PEOPLE AGED 50 YEARS AND OVER

ACTIVIDAD FÍSICA Y ESTADO DE SALUD EN PERSONAS MAYORES DE 50 AÑOS

Lera-López, F.¹; Garrues Irisarri, M.A.²; Ollo-López, A.³; Sánchez Iriso, E.⁴; Cabasés Hita, J.M.⁵ y Sánchez Santos, J.M.⁶

¹ Associate Professor, Universidad Pública de Navarra (Spain) lera@unavarra.es

² Assistant Professor, Universidad del País Vasco (Spain) mirianaranzazu.garrues@ehu.es

³ Associate Professor, Universidad Pública de Navarra (Spain) andrea.ollo@unavarra.es

⁴ Associate Professor, Universidad Pública de Navarra (Spain) eduardo.sanchez@unavarra.es

⁵ Full Professor, Universidad Pública de Navarra (Spain) jmcabases@unavarra.es

⁶ Associate Professor, Universidad de La Coruña (Spain) santos67@udc.es

Spanish-English translator: Proof Reading Service. <http://www.proof-reading-service.com/es/>

Acknowledgements

This study was developed within the framework of the research project 'Sport and physical activity and its impact on the health and wellbeing of citizens: Economic Implications (186 / UPB10 / 12)' funded by the Spanish National Sports Council.

Código UNESCO/UNESCO Code: 3210 (Medicina Preventiva/Preventive Medicine), 3212 (Salud Pública/Public Health) 332906 (Servicios sanitarios/Sanitary services)

Clasificación del Consejo de Europa/Council of Europe Classification: 17. Otras: Actividad Física y Salud / Others: Physical Activity and Health

Recibido 19 de febrero de 2015 **Received** February 19, 2015

Aceptado 26 de noviembre de 2015 **Accepted** November 26, 2015

ABSTRACT

The purpose of the study was to analyse possible related effects between exercise and self-perceived health among people over 50 years old.

A survey was conducted in 2012 to 765 community-living subjects from Spain aged between 50 and 70 years. The survey includes the long version of the International Physical Activity Questionnaire (IPAQ) to estimate total physical activity/week in METS (Measure Activity in Metabolic Equivalents) and in four different domains: work, leisure, transport and domestic/gardening. Self-perceived health was measured using the Visual Analogic Scale of the EQ-5D-5L.

The results of the study show that only the level of physical activity developed in leisure time has a positive and statistically significant effect on self-perceived health, whilst the other domains of physical activity are non-significant. Additionally, age, lower educational level and a higher use of health-care services are negatively associated with self-perceived health. To sum up, leisure time physical activity could be an alternative to increase the quality of life of older people.

KEYWORDS: physical activity, self-perceived health, MET, health-care services use.

RESUMEN

El propósito del estudio es analizar los posibles efectos de la actividad física sobre la salud autopercebida. Para ello, se encuestaron a 800 personas entre 50-70 años durante 2012 en España. Se utilizó el cuestionario internacional de actividad física (IPAQ) para estimar el equivalente metabólico de la tarea (MET) total y en cuatro ámbitos: trabajo, ocio, hogar y desplazamientos. La salud auto-percebida se obtuvo de la escala visual analógica del EQ-5D-5L.

Los resultados muestran que únicamente el gasto energético de actividad física en el tiempo de ocio incide positivamente en el nivel de salud percibido, el resto de ámbitos no tienen influencia significativa. Asimismo, la autopercepción de la salud es más negativa con mayor edad, menor nivel educativo y mayor frecuencia de uso de servicios sanitarios. En conclusión, la actividad física desarrollada en el tiempo libre podría plantearse como alternativa para mejorar la calidad de vida de los mayores.

PALABRAS CLAVE: actividad física, salud autopercebida, MET, España, uso de servicios sanitarios.

INTRODUCTION

Spain, as in other developed countries, is experiencing progressive aging of the population. The National Institute of Statistics (INE) notes that in 2014, 18.2% of the Spanish population is over 65 years. This percentage will increase to 25% in 2029 and to 38.7% in 2064 (INE, 2014). We have managed to extend life for 20.5 years from 65 years, but only nine healthy life years, until the age of 74 years (Organisation for Economic Co-Operation and Development, OECD, 2015).

Aging is associated with a decrease in physical activity (PA) and increased sedentariness (Godfrey et al., 2014; Salinas Martinez et al., 2010). The most recent statistics in Europe (European Commission, 2010) show that 35% of the European population does not practice PA. This data are more worrying if we consider that regular practice has beneficial health effects. Only 38% of Europeans regularly perform some PA. Current data for Spain (Centro de Investigaciones Sociológicas, CIS, 2014) indicates that 40% of Spanish people regularly do some walking.

In general, the population is aware of the effects on health of both activity and inactivity but, among elderly people, those who do not meet the minimum activity requirements are more than those who do (Godfrey et al., 2014). PA practice has been promoted by emphasising the positive effects on health, with specific recommendations for seniors and general information to develop activity in leisure time (Lee et al., 2012; WHO, 2010). The aim of the World Health Organization (WHO) is to integrate the activity as one of the cornerstones of active and healthy aging (WHO, 2010) and to increase the levels of PA undertaken by the elderly population in the coming years.

Recent studies focusing on the Spanish population show that the amount of PA has reduced from 2006 to 2011 (Casado-Pérez et al., 2015). We found a close relationship between the amount of physical activity, functional level and health of the elderly population (Cimarras-Otal et al., 2014). Other studies in Spain have shown a relationship between PA and health in the elderly, although in general these studies are regional or local (Leon-Meadows et al., 2011; Romero et al., 2010; Serrano-Sánchez et al., 2013). Also, studies in other countries have shown the positive relationship between PA and health for similar age ranges (Gebel et al., 2015; Mesters et al., 2014.). Considering other age segments, works such as Arem (2015), Beyer et al. (2015), Campos et al. (2014), or Rosenkranz et al. (2013) among others have proven the positive relationship between quality of life and self-perceived health as a result of the practice of PA. All this emphasises the importance of PA for healthy aging.

Our work contributes to this field of research by distinguishing between the different areas of PA in order to identify which of these can lead to better health perception. Thus, the purpose of this research is to analyse in our country the potential impact of PA on perceived health, using validated tools, the questionnaire EQ-5D-5L and the IPAQ in its long version, in a representative sample of the Spanish population aged between 50 and 70 years. We focused

on this age group for different reasons. First, because we wanted to study the general population, instead of focusing on specific diseases, the approach usually followed by numerous studies in the field (e.g. Abell et al., 2005; Stein et al., 2014.). Second, and in the context of the growing aging population, the subset of the population of 50 to 70 years is a relevant age group for health prevention and healthy aging, and for controlling public health resources (Ackermann, 2008; Mesters et al., 2014).

MATERIAL AND METHODS

The data set used in this paper is based on the Physical Activity, Health and Well-being Survey carried out by the authors with the financial support of the Spanish Council of Sports. The sample was selected based on a stratified sampling of municipalities (four different categories of population size), with gender and age proportions reflecting the national and regional population according to data from the Spanish National Statistics Institute (INE) (2011). The survey was conducted in October and November 2012 by means of a computer-assisted telephone interviewing (CATI) system, with a 95.4% response rate. The sampling error was 3.5% and the confidence level 95.5%, with a final sample of 800 interviews.

Given the objective of the paper, from the initial sample of 800 interviewees, all those who did not complete all the information requested in the different sections of the questionnaire, were excluded from the analysis. This means that the final sample had 765 interviewees. It should be noted that we have verified that this final sample met the requirements of gender and age distribution previously established. Thus, in the case of gender, the distribution between men and women in the initial sample is 48.25% men and 51.75% women; while in the case of the final sample it was 48.5% men and 51.5% women. At the beginning of the interview, interviewers explained the main objective of the survey, as well as individual data confidentiality, and interviewees gave their consent. In this way, to respect the usual ethical standards, individual data have been treated anonymously, always presenting the global data of the sample.

This survey consists of three sections: 1) Measure of the PA level, applying the *International Physical Activity Questionnaire* (IPAQ); 2) The EQ-5D-5L questionnaire, jointly with other questions regarding interviewees' health problems and use of health services; 3) Sociodemographic characteristics.

The dependent variable, self-perceived health related quality of life, is extracted using the EQ-5D-5L. This instrument, developed by the EuroQoL Group (www.euroqol.org) allows describing and assessing of health related quality of life, generating a cardinal health index, which has considerable potential for use in economic evaluation. In addition, this instrument has proved useful as a measure of population health (EuroQoL, 1990; Rabin & Charro, 2001).

The EQ-5D-5L has two parts: the EQ-5D descriptive system and the Visual Analogue Scale (VAS). The descriptive system comprises five dimensions:

mobility, self-care, usual activities, pain / discomfort and anxiety / depression. Each of these dimensions has five possible answers or severity levels (no problems, slight problems, moderate problems, severe problems, extreme problems). The combination of these levels in each dimension defines a total of 3125 (5^5) health states. In the VAS, individuals score their health between two extremes, 0 and 100, the worst and the best imaginable health status, respectively. In our study we used the VAS numbers given by the respondents.

The main independent variable is the level of PA. It is estimated through the application of the IPAQ, an instrument previously tested and validated in international studies for many countries and also in Spain in adults between 15 and 69 years, showing high reliability and validity (Craig et al., 2003; Román Viñas et al., 2010, 2013).

The phone version of the IPAQ, reporting on the past week, in its Spanish version translated for Spain (Roman Viñas et al., 2013) is used. Despite its potential interest, people over 69 years were not included as they tend to overestimate their activity (Hurtig-Wennlöf et al., 2010). The result of the IPAQ is the metabolic equivalent of task (MET) that expresses the physiological wear that represents the activity as compared to the resting position. Five variables of the IPAQ are used, related to four areas of life: 1) work (METsWork), 2) displacement (METsDisp), 3) home (METsHom), 4) leisure or free time (METsLeis) and 5) total METs (METsTot) representing the sum of METs in different areas. Values are expressed in METs·minutes·week⁻¹. Physical activity in leisure time refers to structured or unstructured activities developed voluntarily in leisure time for different purposes, such as personal and social enjoyment in competition or as a way to improve the ability and capacity of the individual.

Finally, other explanatory variables of health status that literature has traditionally considered were included, such as sociodemographic variables like gender, age and educational level (Olsen & Dahl, 2007; Pino et al., 2014). The educational level has been established according to the categories from the INE (National Institute of Statistics in Spain). Additionally, following the previous literature (Abu-Omar et al., 2008; Sari, 2010) three variables of health care utilisation were also included as determinants of self-perceived health, due to its relationship to adverse events from the point of view of health: number of hospitalisation days (hospital), days admitted to a day hospital service (day hospital), and number of times that interviewees have used emergency services (emergency). These variables have traditionally been included in the National Health Survey in Spain. Table 1 summarises the characteristics of the sample and the variables used.

In the empirical analysis, linear regression models estimated by ordinary least squares method (OLS) were used.

The following model captures the final multivariate specification to be tested:

$$\text{VAS} = K + \alpha \text{ PA} + \beta X + \delta \text{ SS} + \mu \text{ (Green, 2012; Novales, 2000)}$$

where VAS (visual analogue scale) represents the level of self-perceived health, K the intercept, PA the variable or vector of variables that reflect the metabolic equivalents of different tasks, X the sociodemographic variables (gender, age and educational level), SS the vector which includes the three variables of consumption and utilisation of health services and μ the error term.

Table 1. Sample characteristics; variables used and its descriptives.

Variables	Mean	St. Dev.
DEPENDENT		
Self-perceived health: VAS (Visual Analogue Scale) (0=worst self-perceived health, 100=best self-perceived health)	69.860	19.341
INDEPENDENTS		
Physical activity (TOTAL and by areas of life)		
METsTot:	6.446	6.107
METsWork:	1.770	4.992
METs Disp	0.843	1.077
METsHom	2.589	2.902
METsLeis	1.243	1.488
Sociodemographics		
Gender		
Male (0)	48.50%	
Female (1)	51.50%	
Age		
50-54 years	30.33%	
55-59 years	23.92%	
60-64 years	25.23%	
65-70 years	20.52%	
Level of education		
Primary	27.95%	
Secondary	54.99%	
Tertiary	17.06%	
Health services utilisation		
Hospital: number of hospitalization days	0.094	0.292
Day hospital: days admitted to a day hospital service	0.106	0.292
Emergency: number of times that interviewees have used emergency services	0.172	0.378

METs= metabolic equivalent of task METsTot= Sum of METS in different areas of life, METsWork= METs in work, METsDisp= METs in displacement, METsLeis= METs in leisure time. St. Dev.= Standard deviation. The final sample had 765 interviewees.

RESULTS

Tables 2 and 3 show three alternative versions or proposals for a model that analyses the relationship between self-perceived health and the amount of PA performed. These proposals vary in the number and type of independent variables included. The difference between them is that in Table 2, Total METs are considered, while in Table 3, METs are considered disaggregated by each of the areas described in the methodology of the IPAQ.

Physical activity

In the first and second model specification in Table 2, we can show that PA in all areas of life together, Total METs, had a positive effect on self-perceived health. However, there is a possible inverse effect, that is, that worse self-perceived health leads to lower PA. The way to discount for this effect has been to introduce the use of health services as control variables.

When analysing the relationship between PA in each of the areas and self-perceived health in Table 3, results show that only the realisation of PA in leisure time has a positive impact on the level of self-perceived health, even discounting for the effect of health services utilisation.

Summarising, if considering PA in all areas of life together, it results in a positive effect on self-perceived health. When analysing it by areas, only PA in leisure time has a significant effect, with a 95% confidence level.

Sociodemographic variables

In the second specification of the model in Tables 2 and 3, in addition to PA, sociodemographic variables are included. In these specifications we find that women show worse self-perceived health than men, although this effect is not statistically significant. Regarding age, one can see that compared with younger individuals in the sample, those between 50–54 years, respondents in groups of 60–64 years and 65–70 years have worse self-perceived health, with no significant difference between self-perceived health of the youngest and those aged between 55 and 59 years. Finally, we can see that the higher the level of education, the higher the value that individuals give to their health. These results are also maintained when new variables are incorporated into the model, as shown in the third specification.

Table 2. Physical activity and self-perceived health. OLS estimations.

	(Model 1)		(Model 2)		(Model 3)				
	Coef.	Sig	Std.Err.	Coef.	Sig	Std.Err.			
Const	68.112**		(1.088)	70.964**		(3.164)	74.480**		(3.079)
METsTot	0.271**		(0.123)	0.247**		(0.122)	0.153		(0.120)
Sociodemographics									
Female				-1.729		(1.399)	-1.842		(1.358)
55-59 years				-0.038		(0.031)	-0.040		(0.031)
60-64 years				-0.091**		(0.030)	-0.094**		(0.029)
65-70 years				-0.063**		(0.030)	-0.068**		(0.029)
Secondary				2.729		(1.745)	2.900 *		(1.680)
Tertiary				7.295**		(2.165)	6.811**		(2.086)
Health services									
Hospital							-5.131*		(2.779)
Day hospital							-9.097**		(2.544)
Emergency							-6.684**		(1.888)
n	765		765		765				
R² adjusted	0.006		0.033		0.088				
InL	-3.35e+003		-3.33e+003		-3.31e+003				

Note: sig.* indicates that is significant at 10% level. ** indicates that is significant at 5% level.

Table 3. Physical activity by areas of life and self-perceived health. OLS estimations.

	(Modelo 1)		(Modelo 2)		(Modelo 3)	
	Coef.	Sig	Err.Est.	Coef.	Sig	Err.Est.
Const	67.055**	(1.298)	68.659**	(3.256)	68.659**	(3.186)
METsTrab	0.259*	(0.134)	0.183	(0.132)	0.183	(0.132)
METsDesp	0.862	(0.698)	0.895	(0.711)	0.895	(0.679)
METsHog	-0.282	(0.262)	-0.169	(0.287)	-0.169	(0.285)
METsOcio	1.890**	(0.461)	1.732**	(0.460)	1.732**	(0.466)
Sociodemographics						
Female			-0.587	(1.490)	-0.587	(1.452)
55-59 years			-0.036	(0.031)	-0.036	(0.031)
60-64 years			-0.093**	(0.030)	-0.093**	(0.029)
65-70 years			-0.070**	(0.030)	-0.070**	(0.030)
Secondary			2.040	(1.742)	2.040	(1.684)
Tertiary			6.370**	(2.163)	6.370**	(2.094)
Health services						
Hospital					68.659**	(2.737)
Day hospital					0.183	(2.508)
Emergency					0.895	(1.864)
n	765		765		765	
R² adjusted	0.026		0.050		0.101	
InL	-3.34e+003		-3.33e+003		-3.3e+003	

Note: sig.* indicates that is significant at 10% level. ** indicates that is significant at 5% level.

Health services utilisation

In the last specification of the model estimated in Tables 2 and 3, three variables related to use of health services are added to the main ones and the sociodemographic variables. As expected, we can observe that the use of any of the three health services is negatively and significantly related with self-perceived health.

DISCUSSION

The results of this study show that in adults and elderly the level of PA has a positive effect on their self-perceived health. Regarding the level of PA in different areas of life, the analysis shows that the level of PA in leisure time is the one that has a significant effect on self-perceived health.

These results partially confirm that encouraging PA can be considered as a major public health strategy for the elderly (Serrano et al., 2013). PA can be beneficial as a method of preventing the development of diseases, and can also be therapeutic, by improving parameters of health and health-related quality of life of elderly people (Garatachea et al., 2009). Previous studies confirm that the more active a person is, the lower the health care costs for society (Yang et al., 2011), possibly through lower utilisation of health resources and services. The study done by Sari (2010) shows a negative relationship between PA and hospital

stays, and researchers such as Bauman et al. (2009) argue that promoting PA can be considered the best buy in public health.

Several studies have established the direct relationship between PA and health of individuals (e.g. Abu-Omar et al., 2004; Blacklock et al., 2007; Gebel et al., 2015; Mesters et al., 2014). Studies done in Spain have had a local approach and have focused on showing the relationship between the amount of total PA and self-perceived health (León-Meadows et al., 2011; Serrano-Sánchez et al., 2013).

The main contribution of this study is the identification of the area of PA that relates to self-perceived health of people between 50 and 70 years in the general context of the Spanish population. The physical activity done in leisure time is the one which has the most impact on self-perceived health. It is important to note that any strategies and policies to improve the health of the Spanish population should especially consider the different physical activities done during leisure time.

On the other hand, our study shows a negative relationship of self-perceived health with age, confirming previous empirical evidence (Olsen & Dahl, 2007; Pino et al., 2014; Romero et al.). Moreover, a positive relationship to educational level is obtained, confirming previous evidence from Spain (Karlsdotter et al., 2012; Pino et al., 2014); women have lower values of self-perceived health, confirming other studies (e.g. Olsen & Dahl, 2007), although this negative relationship is not statistically significant. Regarding use of health services, a greater use of them is negatively related to self-perceived health, as expected.

Finally, some of the limitations of this work should be pointed out, coming from the use of subjective indicators to measure the level of PA and self-perceived health. Although these indicators have been validated in previous studies in different countries, including Spain, these variables may be subject to so-called socially desirable response bias (inclination of interviewed people to attribute to them behaviours and/or characteristics that are properly viewed by society). Also, the use of a telephone survey based on a list of home telephones can introduce some bias; however, this bias, if it exists, can be considered small given the age range tested in this study. Finally, the inclusion of active and retired persons in the sample could introduce some limitation to the interpretation of some results by area of activity.

CONCLUSIONS

The study shows how in people between 50 and 70 years in Spain, the amount of PA performed has a positive impact on self-perceived health. The analysis done using the areas of PA points out that only PA developed in leisure time has a significant effect on self-perceived health. Consequently, the PA developed in leisure time could be viewed as an alternative for improving the health-related quality of life of elderly people. An improvement on self-perceived health, in addition to contributing to reducing health care costs associated especially with

the treatment of chronic diseases, would help to improve the level of subjective well-being.

REFERENCES

- Abell, J., Hootman, J., Zack, M., Moriarty, D., & Helmick, C. (2005). Physical activity and health related quality of life among people with arthritis. *Journal of Epidemiology & Community Health*, 59(5): 380–385. <https://doi.org/10.1136/jech.2004.028068>
- Abu-Omar, K., & Rütten, A. (2008). Relation of leisure time, occupational, domestic, and commuting physical activity to health indicators in Europe. *Preventive Medicine*, 47(3), 319-323. <https://doi.org/10.1016/j.jpmed.2008.03.012>
- Abu-Omar, K., Rütten, A. & Robine, J. (2004). Self-rated health and physical activity in the European Unions. *Soz Präventivmed*, 49(4), 235-242. <https://doi.org/10.1007/s00038-004-3107-x>
- Arem, H., Moore, S.C., Patel, A., Hartge, P., de Gonzalez, A.B., Visvanathan, K. et al. (2015). Leisure Time Physical Activity and Mortality: A Detailed Pooled Analysis of the Dose-Response Relationship. *JAMA Internal Medicine*, 175(6), 959-967. <https://doi.org/10.1001/jamainternmed.2015.0533>
- Bauman, A., Bull, F., Chey, T., & Craig, C.L., Ainsworth, B.E., & Sallis, JF, et al. (2009). The International Prevalence Study on Physical Activity: results from 20 countries. *International Journal of Behavioral Nutrition and Physical Activity*, 6, 21. <https://doi.org/10.1186/1479-5868-6-21>
- Beyer, A., Wolff, J., Warner, L., Schüz, B., Wurm, S. (2015). The role of physical activity in the relationship between self-perceptions of ageing and self-rate health in older adults. *Psychology & Health*, 30(6), 671-685. <https://doi.org/10.1080/08870446.2015.1014370>
- Blacklock, R.E., Rhodes, R.E., & Brown, SG. (2007). Relationship between regular walking, physical activity and health related quality of life. *Journal of Physical Activity Health*, 4(2), 138-152. <https://doi.org/10.1123/jpah.4.2.138>
- Craig, C., Marshall, A., Sjörström, M., Bauman, A., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., & Sallis, J.F. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, 35(9), 1365-1381. <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>
- Campos, A.C.V., Ferreira, E.F., Vargas, A.M.D., Albala, C. (2014) Aging, Gender and Quality of Life (AGEQOL) study: factors associated with good quality of life in older Brazilian community-dwelling adults. *Health and Quality of Life Outcomes*, 12(1), 1-11. <https://doi.org/10.1186/s12955-014-0166-4>
- Casado-Pérez, C., Hernández-Barrera, V., Jiménez-García, R., Fernández-de-las-Peñas, C., Carrasco-Garrido, P., López-de-Andrés, A., et al. (2015). Time trends in leisure time physical activity and physical fitness in the elderly: Five-year follow-up of the Spanish National Health Survey (2006–2011). *Maturitas*, 80(4), 391-398. <https://doi.org/10.1016/j.maturitas.2014.12.014>

- Centro de Investigaciones Sociológicas, CIS (2014). *Barómetro de Junio 2014*. Estudio 3029. Retrieved 12 January 2015 from <http://www.cis.es>.
- Cimarras-Otal, C., Calderón-Larrañaga, A., Poblador-Plou, B., González-Rubio, F., Gimeno-Feliu, LA., Arjol-Serrano, JL., et al. (2014). Association between physical activity, multimorbidity, self-rated health and functional limitation in the Spanish population. *BMC Public Health*, 14(1), 1170. <https://doi.org/10.1186/1471-2458-14-1170>
- European Commission (2010). *Sport and physical activity*. Special Eurobarometer 224/Wave 72.3. TNS Opinion & Social. EU. Bruselas.
- EuroQoL Group (1990). EuroQoL – a new facility for the measurement of health-related quality of life. *Health Policy* 16(3), 199-208. www.euroqol.org. [https://doi.org/10.1016/0168-8510\(90\)90421-9](https://doi.org/10.1016/0168-8510(90)90421-9)
- Garatachea, N., Molinero, O., Martínez-García, R., Jiménez-Jiménez, R., González-Gallego, J., & Márquez, S. (2009). Feelings of well being in elderly people: Relationship to physical activity and physical function. *Archives of Gerontology and Geriatrics*, 48(3), 306-12. <https://doi.org/10.1016/j.archger.2008.02.010>
- Gebel, K., Ding, D., Chey, T., Stamatakis, E., Brown, W.J., & Bauman AE. (2015). Effect of Moderate to Vigorous Physical Activity on All-Cause Mortality in Middle-aged and Older Australians. *JAMA Internal Medicine*, 175(6), 970-977. <https://doi.org/10.1001/jamainternmed.2015.0541>
- Godfrey, A., Lord, S., Galna, B., Mathers, JC., Burn, DJ., Rochester, L. (2014). The association between retirement and age on physical activity in older adults. *Age and Ageing*, 43(3), 386-93. <https://doi.org/10.1093/ageing/aft168>
- Green, W.H. (2012). *Econometric analysis*, 7th edition. England, Pearson.
- Hurtig-Wennlöf, A., Hagströmer, M., & Olsson, L.A. (2010). The International Physical Activity Questionnaire modified for the elderly: aspects of validity and feasibility. *Public Health Nutrition*, 13(11), 1847. <https://doi.org/10.1017/S1368980010000157>
- Spanish National Statistics Institute, INE (2014). *Proyección de la población de España 2014-2064*. Notas de Prensa, 28 de octubre de 2014. Retrieved 20 January 2015 from <http://www.ine.es>.
- Karlsdotter, K., Martin Martin, J., & Puerto López, M. (2012). Multilevel analysis of income, income inequalities and health in Spain. *Social Science & Medicine*, 74, 1099-1106. <https://doi.org/10.1016/j.socscimed.2011.12.020>
- Lee, I.M., Shiroma, E.J., Lobelo, F., Puska, P., Blair, S.N., & Katzmarzyk, P.T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*, 21:380(9838), 219-229. [https://doi.org/10.1016/S0140-6736\(12\)61031-9](https://doi.org/10.1016/S0140-6736(12)61031-9)
- León-Prados, J.A., Fuentes, L., González-Jurado, J.A., Fernández, A., Costa, E., & Ramos, A.M. (2011). Actividad física y salud percibida en un sector de la población sevillana: estudio piloto. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 10(41), 164-180.
- Novales, A. (2000). *Econometría*, 2a edición. Madrid, McGraw-Hill.
- Organisation for Economic Co-Operation and Development, OECD (2015). *Health Statistics 2015*. Retrieved 18 August 2015 from <http://www.oecd.org/els/health-systems/health-data.htm>

- Olsen, K., & Dahl, S. (2007). Health differences between European countries. *Social Science & Medicine*, 64, 1665-1678.
<https://doi.org/10.1016/j.socscimed.2006.11.031>
- World Health Organization, WHO (2010). *Global recommendations on physical activity for health*. Geneva: WHO. Retrieved 15 October 2014 from <http://who.int/dietphysicalactivity/pa/en/index.html>
- Pino, L., González-Vélez, A., Prieto-Flores, M.E., Ayala, A., Fernandez-Mayoralas, G., Rojo-Perez, F., Martinez-Martin, P., & Forjaz, MJ. (2014). Self-perceived health and quality of life by activity status in community-dwelling older adults, *Geriatrics Gerontology International*, 14, 464-473.
<https://doi.org/10.1111/ggi.12119>
- Rabin, R., & de Charro F. (2001). EQ-5D: a measure of health status from the EuroQol Group. *Annals of Medicine*, 33, 337-343.
<https://doi.org/10.3109/07853890109002087>
- Román Viñas, B., Ribas Barba, L., Ngo, J., & Serra Majem, L. (2013). Validación en población catalana del cuestionario internacional de actividad física. *Gaceta Sanitaria*, 27, 254-257.
<https://doi.org/10.1016/j.gaceta.2012.05.013>
- Román-Viñas, B., Serra-Majem, L., Hagströmer, M., Ribas-Barba, L., Sjöström, M., & Segura-Cardona, R. (2010). International Physical Activity Questionnaire: reliability and validity in a Spanish population. *European Journal of Sport Science*, 10(5):297-304.
<https://doi.org/10.1080/17461390903426667>
- Romero, S., Carrasco, L., Sañudo, B. & Chacón, F. (2010). Actividad física y percepción del estado de salud en adultos sevillanos, *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 10(39), 380-392.
- Rosenkranz, R.R., Duncan, M.J., Rosenkranz, S.K., Kolt, G.S. (2013). Active lifestyles related to excellent self-rated health and quality of life: cross sectional findings from 194,545 participants in The 45 and Up Study. *BMC Public Health*, 13(1), 1071. <https://doi.org/10.1186/1471-2458-13-1071>
- Salinas Martínez, F.S., Cocca, A., Mohamed, K., & Ramírez, J.V. (2010). Actividad física y sedentarismo: repercusiones sobre la salud y calidad de vida de las personas mayores. *Retos*, 17, 126-129.
- Sari, N. (2010). A short walk a day shortens the hospital stay: Physical activity and the demand for hospital services for older adults. *Canadian Journal of Public Health*, 101(5), 385-389. <http://dx.doi.org/10.17269/cjph.101.1962>
- Serrano-Sanchez, J.A., Lera-Navarro, A., & Espino-Torón, L. (2013). Actividad física y diferencias de fitness funcional y calidad de vida en hombres mayores, *Revista Internacional de Medicina y Ciencias de las Actividad Física y el Deporte*, 13(48), 87-105.
- Stein, AC., Molinero, O., Salguero, A., Corrêa, MCR., & Márquez, S. (2005) Actividad física y salud percibida en pacientes con enfermedad coronaria. *Cuadernos de Psicología del Deporte*, 14(1), 109-116.
<https://doi.org/10.4321/S1578-84232014000100013>
- Yang, G., Niu, K., Fujita, K., Hozawa, A., Ohmori-Matsuda, K., & Kuriyama, S., et al. (2011) Impact of physical activity and performance on medical care

costs among the Japanese elderly. *Geriatrics & Gerontology International*, 11(2),157-165. <https://doi.org/10.1111/j.1447-0594.2010.00651.x>

Número de citas totales / Total references: 38 (100%)

Número de citas propias de la revista /Journal's own references: 3 (7,89%)