



apunts

MEDICINA DE L'ESPORT

www.apunts.org



REVIEW

Physical activity and health in teachers. A review

Yury Rosales-Ricardo^{a,*}, David Orozco^a, Lorena Yaulema^a, Ángel Parreño^a, Vinicio Caiza^a,
Virginia Barragán^a, Alejandra Ríos^a, Lilia Peralta^b

^aEscuela de Educación para la Salud, Facultad de Salud Pública, Escuela Superior Politécnica de Chimborazo, Chimborazo, Ecuador

^bEscuela de Nutrición, Facultad de Salud Pública, Escuela Superior Politécnica de Chimborazo, Chimborazo, Ecuador

Received 3 May 2016; accepted 11 July 2016

KEYWORDS

Physical activity;
Exercise;
Teachers

Abstract

Most university teachers have sedentary lifestyles, a product of the job itself. Scientific articles published between January 1999 and February 2016 were reviewed in terms of bibliography and documentary evidence, with a view to updating existing knowledge of physical activity and its effect on the health of teachers, internationally. The databases searched were Medline, Scopus and Scielo. The search was run using PubMed, and classified by two search objectives. The following keywords were used in English and Spanish: physical activity, physical exercise and teachers (*actividad física, ejercicio físico, docentes*). Studies on the physical activity of any kind of teacher, internationally, was selected. Eight studies were found, all applied at different levels of experimentation (pre, quasi, and experimental), which demonstrated the benefits of physical activity in populations of current and future teachers.

© 2017 FC Barcelona. Published by Elsevier España, S.L.U. All rights reserved.

PALABRAS CLAVE

Actividad física;
Ejercicio;
Docentes

Actividad física y salud en docentes. Una revisión

Resumen

Los docentes de las universidades en la mayoría de los casos tienen estilos de vida sedentarios producto de su propio trabajo. Por tanto, se realizó un estudio de revisión documental y bibliográfica de artículos científicos publicados entre enero de 1999 y febrero de 2016 con el objetivo de actualizar los conocimientos existentes sobre la actividad física relacionada con la salud de docentes a nivel internacional. Las bases de datos consultadas fueron Medline, Scopus y Scielo. La búsqueda se realizó mediante PubMed y fue clasificada por 2 objetivos de búsqueda. Se usaron las siguientes palabras clave: activi-

* Corresponding author.

E-mail address: yuryrr82@gmail.com (Y. Rosales-Ricardo)

dad física, ejercicio físico, docentes; en idioma español e inglés (*physical activity, physical exercise, teachers*). Se seleccionaron los estudios de aplicación de la actividad física en docentes de cualquier tipo de enseñanza, a nivel internacional. Se encontraron 8 estudios, todos de aplicación, en los diferentes niveles de experimentación (pre-, cuasi- y experimental) en los que se demostraron los beneficios de la actividad física en poblaciones de docentes y futuros docentes.

© 2017 FC Barcelona. Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Introduction

Regular physical activity, adapted to the individual ability and characteristics of people, has beneficial effects for organic and physiological health. This assertion is corroborated by an infinity of scientific documentation.¹⁻¹⁰ This type of activity not only brings benefits for people's physical wellbeing but also contributes to improving mental and social health.

Physical activity is defined as any bodily movement produced by the skeletal muscles that requires energy expenditure. Therefore, physical activity should not be confused with physical exercise. That is a variety of planned, structured, repetitive physical activities which are undertaken with an objective related to improving or maintaining one or more components of physical fitness. Physical activity, on the other hand, includes physical exercise but also, in a broader sense, other activities that involve bodily movement and occur as part of our play and work; active forms of transportation; domestic tasks and recreational activities in general.¹¹⁻¹⁴

The benefits of physical activity in general, in a physical sense, are: better functioning of the cardiovascular, respiratory, digestive and endocrine systems; strengthening of the musculoskeletal system; increased flexibility; decreased serum cholesterol and triglycerides; and benefits for people with impaired glucose tolerance, obesity and adiposity.^{15,17}

On the other hand, the psychological benefits are closely related to greater tolerance to stress; the adoption of protective health habits; an improved perception of self and self-esteem; decreased perceived risk of illness; stress prevention; tranquilising and antidepressant effects; better reflexes and coordination; increased sense of well-being; prevention of insomnia; regulation of sleep cycles and improvements in socialisation processes. Benefits can also be seen in cognitive processes such as memory, planning and decision making.^{18,19}

As for the benefits to mental health, physical activity has been found to reduce clinical depression and may be as effective as traditional treatments (psychotherapy).²⁰ In addition, the practice of physical activity in young women suffering from anorexia reduces some of their self-injurious behaviour. However, in certain sectors of the population resistance can still be found to the possibility of integrating behaviour that improves general health into the daily routines, for which personal, physiological, situational, pro-

grammatic, social, cognitive and behavioural reasons are given. These factors must thus be taken into account when designing programmes to promote physical activity as behaviour which improves health in general.²¹⁻²⁴

Physical activity will tend to depend on an individual's stage of life: in early life it is the game; in youth it takes the form of sport; and in adulthood these experiences are combined in different forms of expression and physical and mental development.²⁵

Whatever physical activity an individual has, this need to be stimulated, and here most of all, the public authorities should promote this strongly, since many benefits are obtained from this across the board. Specifically, this is the case of university teaching staff, who, in most cases, have sedentary lifestyles, which are a product of the characteristics of the job itself.

The main objective of this study, therefore, is to update existing knowledge on physical activity in the health of teachers in the international sphere.

Methodology

A documentary and bibliographical review was run on scientific articles published from January 1999 to February 2016. The databases consulted were Medline, Scopus and Scielo. The searches were done using PubMed and have been classified for two different search objectives. The following keywords were used in English and Spanish: physical activity, physical exercise, teachers (*physical activity, physical exercise, teachers*).

We selected the studies that analysed physical activity in teachers at all levels of education, internationally. Specifically, these were 8 studies, all applicable to different levels of experimentation (pre-, quasi- and experimental).

Inclusion criteria: Studies published between 1999 and 2016 in any country in Spanish and/or English.

Exclusion criteria: Studies that did not assess physical activity in teachers.

The study restricted itself to updating knowledge of the effect of physical activity on the health of teachers internationally; this is therefore a systematic review, with no results to be applied or for action to be taken but, possibly useful for the compilation of information to begin new research and gain a deeper understanding of this important subject.

Results and discussion

We selected the studies that had researched physical activity in teachers at all levels of education, internationally. Specifically, we found 8 studies, all of them pre-, quasi- and experimental (Table 1).

Meneses et al.²⁶ based themselves on the opinion of adults as to physical activity and recreational pursuits. The interviewees were the teaching and administrative staff of 24 pre-school institutions in the Canton of Montes de Oca (Costa Rica). The results showed how the concepts described were not clear to interviewees, and the fact that physical activity occurred only as a habit and not as an agent of organic, physical and mental health. According to the results, the concept of physical activity to improve good health was understood by the interviewees, however, when put into practice, this was limited.

Respondents were asked if they were involved in physical activities, to which 79.8% answered affirmatively and 20.2% answered negatively. Some of them considered that physical and recreational activities meant the same thing. A total of 75% of the interviewees did physical activities at different frequencies per week, however, this data showed that physical activity was not well structured within the daily routine of each subject. When asked whether these physical activities had a positive influence on their health, they answered that these activities enabled them to better use their free time; they served to control stress; provided emotional stability; reduced heart disease; controlled anxiety; depression; reduced obesity; and prevented high blood pressure and muscle weakness, among other benefits. It was important in the questionnaire to respond as regards the particular type of recreational activities that interviewees practiced, as well as how often and their opinion on these.²⁶

During the process of information-gathering on recreational activities, all respondents answered exactly the same as in the case of questions on physical activity in general. Here it can be deduced that interviewees considered physical and recreational activity as being synonymous, whereas there are, in fact, conceptual differences between the two, also in practice. It was concluded that people were aware of the benefits of physical activities, however a lack of education on the importance of physical activity from early childhood prevented this being included in their working routine when they reached adulthood.²⁶

Roldán Aguilar et al.²⁷ identified the levels of physical activity, depression and cardiovascular risks in employees and teaching staff at a university institution (Politécnico Colombiano Jaime Isaza Cadavid) in Medellín, Colombia. From the population of teachers and employees born in or after 1955, a stratified random sample was selected, following the Framingham age scale. Laboratory tests were then run to measure lipid profile and blood glucose. A medical and anthropometric assessment was undertaken using the International Physical Activity Questionnaire (IPAQ for short), and the Hamilton Depression Scale. Out of the total sample evaluated, 45.4% of subjects were sedentary; 40.5% had mild or moderate depression; 10.5% consumed 22 grams or more of alcohol a week; 7% were hypertensive; 75.6% had dyslipidemia; 3.5% were diabetics; 18.6% were obese; and 19.8%

smoked. According to the classification of low-density lipoprotein cholesterol (LDL-c) and high-density lipoprotein cholesterol (LDL-c), 79.1% were borderline or at high risk; 75.6% were borderline, at high risk or moderate, respectively; 43% were at risk according to the arterial index score; and 31.4% had a medium, moderate or high risk of infarction in the next 10 years, according to the Framingham scale. From the descriptive analysis it was concluded that dyslipidemias and sedentarism were the main cardiovascular risk factors found in the population. In addition, lower levels of LDL-c and depression were found in physically active or highly active individuals. This study did not determine the relationship between sedentary individuals and risk factors, or individuals who did physical activity and risk factors, as this study was descriptive and not correlative.

Hernández-Álvarez et al.²⁸ studied the relevance to teachers of certain curricular objectives within the physical education class, and their beliefs about the importance of various factors involved in students doing physical activities outside school. A total of 173 physical education teachers took part, distributed geographically across nine autonomous communities (self-governing regions) in Spain. A questionnaire designed and validated by the research group was applied. The results showed that teachers were of the opinion that their teaching should be oriented above all to responding to "supradisciplinary" social demands which other subjects were also involved in, and that these were less of a priority than the objectives that were unique to physical education (knowledge of the discipline and motor output). Likewise, teachers believed that the least relevant factors in boys and girls being involved in physical activity outside school were those that directly included objectives which physical education contributed to exclusively. Teachers showed a lack of confidence in their more specific possibilities of influencing regular habits of physical activity in their students.

The main objective of another study was to compare the intention to be physically active with the actual weekly practice of physical activity among 451 pre-school and primary teachers who participated in this study (162 males and 353 females). This topic was explored in relation to social and employment variables. The adapted and validated Spanish version of the scale of intention to be physically active indicated a high internal consistency ($\alpha = 0.91$). Other inferential analyses showed that women participated less in physical activity than men. In addition, unmarried teachers with no children scored higher in thinking about and actual practice of physical activity compared to those who were married and had children. Intention and practice were correlated and these results were interpreted in terms of differences in leisure time, as well as in terms of social variables related to leisure time.²⁹

Blázquez Manzano et al.²⁹ identified the relationship between the level of physical activity and the perception of quality of life (QoL) among those who make up the university community. The total number of subjects chosen for this study was 558: 83 teaching staff, 33 administrative staff and 442 students, randomly selected from all faculties and departments of the university. The results were obtained using the short version of the IPAQ, the SF-36 Health Questionnaire, and an instrument to explore the reasons for

Table 1 Summary of articles found

Year	Author	Country	Objective	Methodology
1999	Meneses et al.	Costa Rica	To determine the levels of physical and recreational activity of people who work in pre-schools	Twenty-four pre-school institutions were selected in the Canton of Montes de Oca. A teacher or member of the administrative staff from each school was interviewed in each case, each of whom answered a questionnaire on the practice of physical activity
2008	Roldán et al.	Colombia	To identify the levels of physical activity, depression and cardio-vascular risks of employees and teachers at a university in Medellín (Colombia)	From the population of teaching staff and employees born in or after 1955, a stratified random sample was selected following the Framingham age scale. On this sample laboratory tests were run to measure lipid profile and glycemia; a medical and anthropometric assessment was made, and respondents completed the International Physical Activity Questionnaire (Short IPAQ)
2010	Hernández et al.	Spain	To ascertain the relevance to the teaching staff of certain curricular objectives and their beliefs as regards the importance of different factors affecting whether students were involved in physical activity outside school	A total of 173 physical education teachers participated, distributed geographically across nine autonomous communities, completing a questionnaire designed and validated by the research group
2015	Blázquez et al.	Spain	To compare the intention to be physically active with actual weekly physical exercise among 451 pre-school and primary school teachers	Participating were a total of 162 men and 353 women. This topic was explored on the basis of social and employment variables. The adapted and validated Spanish version of the scale of intention to be physically active indicated a high degree of internal consistency
2014	Rodríguez et al.	Colombia	To identify the relationship between the level of physical activity and the perception of quality of life among those who make up the university community	The total number of subjects selected was 558: 83 teachers, 33 administrative staff and 442 students, randomly selected from all faculties and departments of the university. The results were obtained from the use of the short version of the International Physical Activity Questionnaire (IPAQ), the SF-36 Health Questionnaire, and an instrument to explore the reasons for physical activity or not, developed for this research

Table 1 (continue)

Year	Author	Country	Objective	Methodology
2007	Hall et al.	Mexico	To estimate the prevalence of the level of physical activity, nutritional status and abdominal obesity in teachers at the Escuela Superior de Educación Física within the Universidad Autónoma de Sinaloa	Thirty-six subjects (32 males and 4 females) were studied to classify the level of physical activity, using the short format of the International Physical Activity Questionnaire (IPAQ), taking anthropometric measurements (weight, height and umbilical circumference)
2013	Gutiérrez et al.	Spain	To identify the attitudes towards physical activity and sport, as well as its range of application, as presented by new pupils in pre-school, primary and physical education and sports	The research design used was cross-sectional, not experimental. The study population consisted of 222 new students from the Faculty of Education and Sport Sciences in Pontevedra, University of Vigo. Of these, 103 were men (46.4%) and 119 were women (53.6%), aged between 17 and 38 years. Participants were given the Questionnaire on Attitudes to Physical Activity (CAAF in its Spanish acronym)
2016	Práxedes et al.	Spain	Analyze the levels of moderate to vigorous physical activity in university students	A total of 901 university students participated at the University of Extremadura, aged between 18 and 49 years (408 men and 493 women), distributed across the 4 years of degree courses and the different postgraduate degrees. All respondents completed the IPAQ-SF. As indicators of physical activity, levels of moderate and vigorous physical activity were used, and the degree of compliance with physical activity recommendations, following the 2010 WHO guidelines

Source: In-house.

physical activity or not, developed for that particular research project. A significant and positive relationship was found between the perception of QoL and actual health and physical activity levels. This relationship was more pronounced in the admin. group, while in the group of teachers, higher levels of actual physical activity were found.

Responding to the research question, we conclude that people involved in higher levels of physical activity also reported a more positive perception of QoL with respect to health. This confirms the findings of the study by Jurgens (2006), where it was shown that sportsmen perceived a better QoL than sedentary individuals. In addition, the perception of QoL is more positive as the level of sports practiced

increased, especially in the domains corresponding to social relations, environment and psychological functioning.

In a similar direction, a positive QoL perception was found for the total sample analysed, where factors related to functionality and social aspects prevailed. These results could be explained by the multiple benefits related to the practice of physical activity, at the physical, psychological and social level. This was related to results found, since it is probable that the benefits of physical activity mentioned were evidenced in the participants of this research in a more positive perception of QoL. On the other hand, these could also be related to the apparent absence of chronic or acute illness in the participants.³⁰

On the other hand, the results on QoL in the group of teachers were related to their higher levels of physical activity. In contrast, differences were found in the relationship between different levels of physical activity, and in the perception of QoL there was homogeneity in the case of some characteristics in the three groups studied. This was more consistent in students (0.23 to 0.01), which probably correlated with sample size. Administrative staff, on the other hand, showed a correlation of 0.42 to 0.05. This may be related to greater sociodemographic homogeneity in the group, which may reduce the effect of intervening variables and contribute to strengthening the correlation. In addition, the decrease in the level of confidence may be due to a wider dispersion in the scores. Finally, the correlation in the group of teachers was 0.22, which, like the other correlations, was significant and positive.³⁰

In terms of marital status, both divorced and married respondents showed higher levels of physical activity than singles. Similar trends were found in single individuals and those living together, a relationship that may be associated with the age group of participants in each marital status category; married and divorced respondents were more likely to be in ages ranging from 35 to 50, a population where, according to the results obtained, higher levels of physical activity were found.³⁰

As regards the area of activity of the participants in the sample, there were higher levels of physical activity in individuals doing technical jobs, followed by those related to the natural sciences, arts, economics and engineering.³⁰

As main arguments for the practice of physical activity, the teachers found those related to beliefs as to the benefits that this offered for health and the fact that it was pleasant. In the case of women, arguments were presented related to psychological factors, such as beliefs. On the other hand, in the admin. group, there were family-related factors, environmental factors and a penchant for physical activity, while for students, the satisfaction with physical activity and previous experience of it were relevant.³⁰

In general, male respondents reported reasons related to the physical environment, the beliefs in health, and the pleasure that activity itself produced; for their part, women referred to family circumstances that made it difficult for them to practice physical activity. These results were in the same vein as other studies that have found that relating activity to fun may not be effective in motivating participation. However, in contrast, the thinking that activity could help in achieving personal goals was more influential in older adults than in young people.³⁰

As for the reasons for not being involved in physical activity, common factors related to time and type of activity (personal factors) were observed in all the 3 groups. There were some factors that prevailed in women – shortage of time, lack of support from peers, parents and teachers, and finally, low self-esteem and low perceived self-efficacy in being physically active. To these factors, among other reasons, were added lack of confidence, lack of money and the necessity to do other things.³⁰

Hall López et al.³¹ estimated the prevalence of the level of physical activity, nutritional status and abdominal obesity in teachers at the School of Physical Education, Universidad Autónoma of Sinaloa (Mexico). Thirty-six subjects

aged 42.8 ± 7.3 years (32 males and 4 females) were studied. To classify the level of physical activity, the short format of the IPAQ questionnaire was applied and anthropometric measurements were recorded (weight, height and umbilical circumference). This resulted in the following data: high level of physical activity: 25%; moderate: 44.4%, and low: 30.6%. The combined prevalence of overweight and obesity with BMI, following WHO criteria, was 90.6% and the prevalence of abdominal obesity, taking the NCEP ATP (III) criteria, was 28.1% for men and 30.6% for women, respectively. The results in this study showed subjects with a high prevalence of physical activity. In contrast, they showed a high rate of overweight and obesity, higher than the average percentages for Mexico. We can conclude that in the case of these subjects, measures should be taken, such as implementing nutrition programmes aimed at curbing the problem of overweight and obesity.

Other research has identified attitudes towards physical activity and sport, as well as their scope of application seen in new pupils in pre-school, primary, physical education and sport. Non-experimental cross-sectional research, using mean comparison analysis for independent samples, ANOVA, and linear regression, compared variables for physical activity and motivation. Significant differences were demonstrated in all groups analysed, so that men who practiced sport at school age, students of physical education and sport, all had attitudes with higher scores for physical activity and sport, firstly than women; secondly, than those who did not practice sports at school age; and thirdly than future graduates of pre-school and primary education. It would be of major importance to run projects involving the promotion of physical activity, sport and the adoption of healthy habits during initial teacher training, especially among women and graduates of Bachelor degrees in pre-school education and primary education. In addition, given the positive influence of physical activity practiced at school age, school sports programmes should be encouraged or increased.³²

Práxedes et al.³³ analysed the levels of moderate to vigorous physical activity in university students. Similarly, they analysed physical activity levels by sex, age and change of state in the trans-theoretical model. A total of 901 students (408 men and 493 women) completed the IPAQ-SF and answered a question to assess the stages of change. Among the results, it was noted that 51.39% of the students did not reach the international recommendations of 30 minutes of moderate to vigorous exercise per day, with a greater compliance in male respondents. Regarding the change, in terms of moderate to vigorous levels of intensity, it was reported that significantly higher values were observed in the phases of physical action and maintenance, compared to other stages, during the physical exercise programme. This indicates guidelines for the development of intervention programmes that affect the promotion of physical activity at the university stage.

Conclusions

According to the results of previous research, in the centres where this was studied, physical activity has generally been

beneficial to current and future teachers. In all studies this hypothesis was demonstrated. Sometimes the levels of motivation for physical activity were not optimum and in the specific case of women, with more occupation at home, and not always assisted by their family, this was a notable impediment. In addition, physical activity was frequently performed incorrectly, nor was this practiced the suggested minimum days per week (frequency) due to lack of knowledge of its effects. This may be due to the maintenance of high levels of obesity and overweight, even where physical activity was practiced.

Physical activity was sometimes merely a habit for teachers and not seen as producing organic, physical and mental health. According to the study results, the concept of physical activity to promote health was understood by the interviewees, however, when putting this into practice, the extent was limited. Very often physical activity was not well structured within the daily activities that each teacher performed. When asked whether these physical activities had a positive influence on health, they answered that these activities enabled better use of free time; they served as a control of stress; for emotional stability; they reduced heart disease, controlled anxiety, depression, they reduced obesity, they prevented high blood pressure and muscle weakness, amongst other effects. It was important in the questionnaire to answer questions on the specific type of recreational activities that the interviewees practiced, as well as the frequency and their opinion of these.

Sometimes, teachers considered physical activity and recreational activity as synonymous, when there were conceptual differences and in practice. It was concluded that people were aware of the benefits of practicing physical activities, but a lack of education on physical activity from pre-school stage prevented the practice of activity being included in their daily work schedule. A significant and positive relationship was found between the perception of QoL regarding health and levels of physical activity. Teachers found as main arguments for the practice of physical activity those related to beliefs about the benefits to health and the fact that it is enjoyable.

Funding

No support was required for the study.

Conflict of interest

The authors declare no conflict of interest.

References

1. Organización Mundial de la Salud. Actividad física [Internet] [accessed 4 Apr 2016]. Available from: <http://www.who.int/dietphysicalactivity/pa/es/>
2. Wideman L, Weltman J, Hartman M, Veldhuis J, Weltman A. Growth hormone release during acute and chronic aerobic and resistance exercise. *Sport Med.* 2002;32:987-1004.
3. Ayaso-Maneiro J, Domínguez-Prado DM, García-Soidán JL. Aplicación de un programa de ejercicio terapéutico en población adulta con discapacidad intelectual. *Apunts Med Esport.* 2014; 49:45-52.
4. Peralta H. Educación física y calidad de vida. México: Prentice Hall; 1999.
5. Carratalá V, Carratalá E. Judo. La actividad física y deportiva extraescolar en los centros educativos. Madrid: Ministerio de Educación, Cultura y Deportes; 2000.
6. Arent S, Landers D. Physical activity and mental health. In: Hausenblas H, Janelle C, Singer R, editors. *Handbook Sport Psych* (Chap. 29). New York: Wiley; 2001.
7. Fogelholm M, Kukkonen M, Harjula K. Does physical activity prevent weight gain? A systematic review. *Obes Rev.* 2010;11:95-111.
8. Mendoza Romero D, Uribina A. Actividad física en el tiempo libre y autopercepción del estado de salud en Colombia. *Apunts Med Esport.* 2013;48:3-9.
9. Hall E, Ekkekakis P, Petruzzello S. The effective beneficence of vigorous exercise revisited. *Br J Health Psych.* 2002;7:47-66.
10. Lawlor D, Hopker S. The effectiveness of exercise as an intervention in the management of depression: Systematic review and meta-regression analysis of randomised controlled trials. *Br Med J.* 2001;322:1-8.
11. Hagger MS, Nikos L, Stuart J. The influence of autonomous and controlling motives on physical activity intentions within the Theory of Planned Behavior. *Br Psych Soc.* 2002;7:283-97.
12. Ming K, Anderson M, Lau M. Exercise interventions: Defusing the world's osteoporosis time bomb. *Bull World Health Organ.* 2003;81, 827-232.
13. Tu W, Stump T, Clar D. The effects of health and environment on exercise-class participation in older, urban women. *J Aging Phys Act.* 2004;12:480-96.
14. Ramírez W, Vinaccia S, Ramón G. El impacto de la actividad física y el deporte sobre la salud, la cognición, la socialización y el rendimiento académico: una revisión teórica. *Rev Est Soc.* 2004;18:67-75.
15. Reverter Masia JM, Jové Deltell C. Ejercicio físico y cognición. *Apunts Med Esport.* 2012;47:37.
16. Weinberg R, Gould D. *Fundamentos de psicología del deporte y el ejercicio.* Madrid: Ariel Psicología; 1996.
17. Rosales Ricardo Y. Masaje y ejercicios físicos en casos con neuropatía edemato-fibro-esclerótica en la atención primaria. *Rev Hab Cienc Med.* 2014;13:475-86.
18. Soblechero F. Diseño individualizado de programas de ejercicio físico para la salud. *Rev Digital.* 2009;14(135) [accessed 21 Mai 2015]. Available from: <http://www.efdeportes.com>
19. Alvar B. Resistance training for the aging adult: An evidence-based approach. National Strength and Conditioning Association (NSCA-USA). 2013 [accessed 2 Apr 2016]. Available from: https://www.nasca.com/videos/conference_lectures/resistance_training_for_the_aging_adult/
20. American College of Sports Medicine. Position stand: Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc.* 2009;41:459-71.
21. Beckers PJ, Denollet J, Possemiers NM, Wuyts FL, Vrints CJ, Conraads VM. Combined endurance-resistance training vs. endurance training in patients with chronic heart failure: A prospective randomized study. *Eur Heart J.* 2008;29:1858-66.
22. Buchner DM. Physical activity guidelines for Americans. U.S. Department of Health and Human Services. 2008 [accessed 12 Mai 2013]. Available from: <http://www.health.gov/paguidelines/guidelines/#toc>
23. Hernando Castañeda G., coordinador. *Nuevas tendencias en entrenamiento personal.* Barcelona: Paidotribo; 2009.
24. Márquez R, Rodríguez J, de Abajo S. Sedentarismo y salud: efectos beneficiosos de la actividad física. *Apunts Educ Fis Dep.* 2006;83:12-24.

25. Basualto-Alarcón C, Rodas G, Galilea PA, Riera J, Pagés T, Ricart A, et al. Cardiorespiratory parameters during submaximal exercise under acute exposure to normobaric and hypobaric hypoxia. *Apunts Med Esport*. 2012;47:65-72.
26. Meneses Montero M, Monge Alvarado J. Actividad física y recreación. *Rev Costarric Salud Púb*. 1999;8(15).
27. Roldán Aguilar E, Lopera Zapata MH, Londoño Giraldo FJ, Tejada Cardeño JL, Vidales Zapata SA. Análisis descriptivo de las variables: nivel de actividad física, depresión y riesgos cardiovasculares en empleados y docentes de una institución universitaria en Medellín. *Apunts Med Esport*. 2008;43:55-61.
28. Hernández-Álvarez JL, Velázquez-Buendía R, Martínez-Gorroño ME, Díaz del Cueto M. Creencias y perspectivas docentes sobre objetivos curriculares y factores determinantes de actividad física. *Rev Int Med Cienc Act Fis Dep*. 2010;10:110-8.
29. Blázquez Manzano A, Ana León-Mejía A, Feu Molina S. Intención y práctica de actividad física en maestros españoles. *Cuad Psic Dep*. 2015;15:163-9.
30. Rodríguez Salazar M, Molina J. Calidad de vida y actividad física en estudiantes, docentes y administrativos de una universidad de Bogotá. *Cuad Hispanoam Psic*. 2014;11:19-37.
31. Hall López J, Morcal Ortiz LR, Ochoa Martínez PY. Nivel de actividad física, estado nutricional y obesidad abdominal en docentes de la escuela superior de Educación Física-UAS. *Cienc Dep Cult Fis*. 2007;1:12-5.
32. Gutiérrez-Sánchez A, Pino-Juste M. Actitudes hacia la práctica de actividad física saludable en futuros docentes. *Cuad Psic Dep*. 2013;13:73-82.
33. Práxedes A, Sevil J, Moreno A, del Villar F, García-González L. Niveles de actividad física en estudiantes universitarios: Diferencias en función del género, la edad y los estados de cambio. *Rev Iberoam Psic Eje Dep*. 2016;11:123-32.