

PHYSICAL ACTIVITY OF SENIOR CITIZENS: QUANTITATIVE ANALYSIS OF LITERATURE DERIVED FROM SCOPUS BASE

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Abstract Introduction. The aim of this paper is to evaluate the development of scientific output, while also to define the scope of the subject matter of research in the sphere of the physical activity of senior citizens. The research process concentrates on the following research questions: In what way has the research output developed in the field of research on the physical activity of senior citizens? Who is the principal participant (countries, universities, authors, source titles in terms of accumulating the research subject matter in a particular field? What are the prominent subject areas that attract the greatest attention among the academic environment?

Research material. Scopus data was availed in the process of selecting a research sample as the source of bibliometric data. The research data (N = 415) consisted of publications which included such phrases in their contents as: “Physically Active Elderly, Physically Active Seniors, Physically Active Older Adults” in their titles or key words. The process of analysis and visualization of the findings was supported by the use of MS Excel software.

Results. The research illustrated that the physical activity of the elderly is a field of science that has a long tradition. In 2011, it gained increasingly high levels of interest among the academic environment, which in turn bore fruit in terms of the breakthrough growth in the number of publications in 2014 that are indexed in Scopus data. This scientific output encompasses 20 research areas.

Conclusions. The principal areas of the greatest number of publications relate to the activity of the elderly are to be found in the areas of medical science and health science. The main authors and co-authors in this field of research are as follows: the representatives of the USA, whereas the most productive research institute is The University of British Columbia. The author of the largest number of publications is Rodríguez-Artalejo from Spain. The main sponsors of research activities in the sphere of the physical activity of the elderly are the National Institutes of Health.

Key words physical activity, bibliometric data, research profiling, senior citizens, elderly adults

Introduction

Regular physical activity is the guarantee of the health of an individual, while also the feeling of happiness and social confidence among senior citizens. Literature on the subject and clinical practice indicate that the physical

activity and improvement of an individual's psychophysical functioning encourages multiplying and strengthening positive therapeutic effects elderly people. (Krejci, Bendikova, Jandova, 2020; Ortenburger, Rodziewicz-Gruhn, Wąsik, Marfina, Polina, 2017; Szerla, Wąsik, Ortenburger, Gwara, Trybulec, 2016; Wąsik, Wójcik, 2017). Contemporary research shows that physical activity may prolong a fit and independent life, as well as improve the quality of life of senior citizens (Ammitzbøll et al., 2015; Wen et al., 2011). Furthermore, it helps to reduce the burden of health care by means of facilitating healthy aging (Davis, Fox, 2007).

The aging of the population almost worldwide has brought new requirements in the sphere of the improvement in the health of elderly people by means of adding "quality" to their prolonged lives (Bowling, 2009). The lack of physical activity is an increasing burden on health worldwide (Lee et al., 2012), while the supervision of physical activity is becoming one of the priorities of global public health in the sphere of preparing effective programs to prevent non-infectious diseases (Hallal et al., 2012).

Depending on the physical activity conducted, there is a beneficial change in the body composition, which counteracts the trend that involves the fact that age usually reduces the fat-free body mass, while increasing the amount of fat (Krejci et al., 2020). The body mass and the body mass index (BMI) usually increase together with the aging process. Subsequently, there is a tendency to decrease. It would seem that at an old age this rises to 27.0. A significant impact on the ratio of muscle mass to adipose tissues is created by the lifestyle, particularly food consumption, energy expenditure and training. From an anthropometric viewpoint, both in the case of men and women, there are changes in the shape of the chest. The comprehensive European research of SENECA conducted in the period of 1988–1999 on people aged between 70–75 years of age indicated that the average height of senior citizens was reduced by between 1.5 cm and 2 cm, while the waist measurement increased by between 3 cm and 4 cm (Krejci, Hill, Hosek, Jandova, Kajzar, 2019).

One of the main causes of the negative impact on the level of physical activity is the low level of balance (Krejci, 2018) and the fear of falling (Ní Chróinín, Ní Chróinín, Beveridge, 2015). Likewise, the fear of certain illnesses associated with the aging process (i.e. Type 2 Diabetes) causes unease which is associated with the loss of balance and risk of falls (De Pew, Karpman, Novotny, Benzo, 2013).

With relation to this fact, in terms of planning physical exercises for senior citizens, it is necessary to take account of the ability to maintain balance, the anthropometric parameters and the psycho-social indicators with regard to sex type, age and individuals. In the case of senior citizens, the most important aspect is that of "safety", thus, professional knowledge that is based on scientific elements is an extraordinarily important aspect in the process of planning physical activities for senior citizens.

It would seem to be necessary to conduct further meticulous research that would involve representative random sampling and consistent use of tried and trusted measurement instruments (Sun, Norman, While, 2013). For this purpose, more data is required on the subject matter of physical activity among elderly people who may prolong health and quality of life in old age.

The question arises here in terms of what the access to specialized literature is here and whether there are many sources that may be recommended on this subject matter. Hence, the aim of this paper is to acquire knowledge on the development of scientific output, while also to define the scope of the subject matter of research in the field of physical activity for senior citizens. The scientific process concentrates on the following research questions:

1. In what way has the research output in the field of research physical activity for senior citizens developed?
2. Who is the principal participant (countries, universities, authors, source titles) in terms of accumulating the research subject matter in a particular field?
3. What are the prominent subject areas that attract the greatest attention among the academic environment?

Material and methods

Scopus data was availed in the process of selecting a research sample as the source of bibliometric data. The research data consisted of publications which included such phrases in their contents as: Physically Active Elderly, Physically Active Seniors, Physically Active Older Adults in their titles or key words.

The following algorithm was used: (TITLE-ABS-KEY (Physical Activity Elderly) AND TITLE-ABS-KEY (Physical activity seniors) AND TITLE-ABS-KEY (Physical activity Older Adults). A general search for results depending on the factors of interest to the researcher of the publications was conducted in order to evaluate the trends in the scientific output and acknowledgement among the leading co-workers in the field of research.

The process of analysis and visualization of the findings was supported by the use of MS Excel software.

Results

The research findings in accordance with the assumed algorithm illustrate 415 entries in Scopus data. According to Figure 1, it is evident that the number of articles on the subject of physical activity for senior citizens is rising. In Figure 2, we can see the number with regard to the country of origin of the authors. The greatest level of interest in this subject matter is shown by the authors from the USA (163 articles), followed by Canada (63 articles) and Spain (23 articles). In Table 1, the chosen bibliometric data has been displayed in order to specify the greatest number of publications divided up into the following.

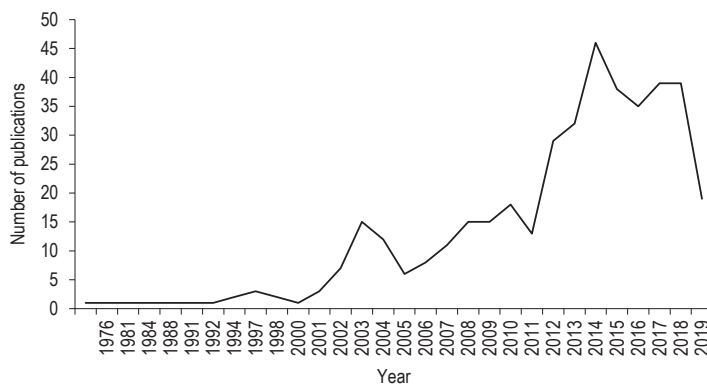


Figure 1. The number of scientific papers with regard to the country of origin of the authors

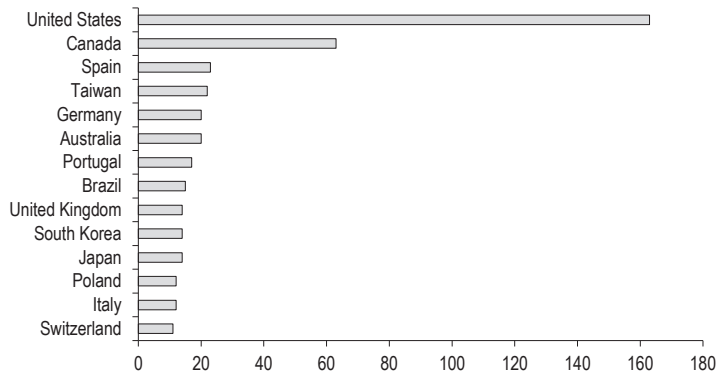


Figure 2. The number of scientific papers relating to the activity of senior citizens in subsequent years

Table 1. Chosen bibliometric data from the analysed sample

Category	Number of publications
Document Type	Article (367), Review (28), Conference Paper (12), Book Chapter (4), Book (2), Conference Review (1), Short Survey (1)
Subject Area	Medicine (325), Nursing (109), Health Professions (58), Biochemistry, Genetics and Molecular Biology (56), Social Sciences (56), Environmental Science (24), Psychology (23), Computer Science (14), Neuroscience (12), Agricultural and Biological Sciences (11), Multidisciplinary (6), Arts and Humanities (5), Engineering (5), Business, Management and Accounting (3), Economics, Econometrics and Finance (2), Mathematics (2), Dentistry (1), Energy (1), Immunology and Microbiology (1), Physics and Astronomy (1)
Documents by funding sponsor (top 13 items)	National Institutes of Health (14), National Institute on Aging (10), Canadian Institutes of Health Research (8), Instituto de Salud Carlos III (5), Japan Society for the Promotion of Science (5), European Commission (4), Fundação para a Ciência e a Tecnologia (4), Horizon 2020 Framework Programme (4), National Research Foundation of Korea (4), European Regional Development Fund (3), Fonds de recherche du Québec – Santé (3), John A. Hartford Foundation (3), Robert Wood Johnson Foundation (3)
Affiliation (top 10 items)	The University of British Columbia (11), University of Toronto (10), Université de Sherbrooke (7), University of Saskatchewan (7), University of Washington, Seattle (7), Universidad Autónoma de Madrid (7), Universidade de Lisboa (7), VA Medical Center (6), Simon Fraser University (6), University of California, San Diego (6)
Author Name (top 8 items)	F. Rodríguez-Artalejo (5), Y. Aoyagi (4), E. García-Esquinas (4), U. Granacher (4), A.C. King (4), J.F. Sallis (4), D.A. Santos (4), R.J. Shephard (4)
Journals (top 20 items)	International Journal of Environmental Research And Public Health (20), Journal of Aging And Physical Activity (15), Journal of The American Geriatrics Society (12), Journal of Nutrition Health And Aging (9), BMC Geriatrics (8), American Journal of Health Promotion (7), Archives of Gerontology And Geriatrics (7), Aging Clinical And Experimental Research (6), Clinical Interventions In Aging (6), Gerontologist (6), Plos One (6), Preventive Medicine (6), Gerontology (5), Journal Of Applied Gerontology (5), Age And Ageing (4), Canadian Journal On Aging (4), Experimental Gerontology (4), International Journal of Behavioral Nutrition And Physical Activity (4), Journal of Geriatric Physical Therapy (4), Medicine And Science In Sports And Exercise (4)

Discussion

On the basis of the analysis conducted, it is evident that the number of scientific papers on the subject matter of the physical activity of senior citizens is increasing (Figure 1). Initially, in the period of 1976–2000 this was not

a very popular subject matter. Only after 2001 did we observe an upward trend. The breakthrough growth in terms of publications was noted between 2011 and 2014, in which there was peak growth.

It is possible to observe that the greatest level of interest in this subject matter is among authors from the USA (31 %), who are unquestionably the leaders. The authors from Canada (12%) publish two and a half times less, while the scientists from Spain (4%) almost eight times less, albeit in spite of this they hold second and third places respectively in this ranking (Figure 2). However, what is interesting is the fact that the author with the greatest number of publications is a citizen of Spain, namely Prof. Rodríguez-Artalejo (Table 1).

Most papers are original works, which constitute 88% of all publications on this subject matter. The principal areas that are the focus of the greatest number of publications are to be found in medical science (subject area: Medicine – 325 items) and health science (subject area: Nursing and Health Professions – 167 items), which constitute a combined total of as much as 68% of all fields of science. The total scientific output encompasses 20 research areas.

The following universities and research institutions are listed as being the prominent lights in this field: The University of British Columbia, University of Toronto, Université de Sherbrooke, University of Saskatchewan, University of Washington, Seattle, Universidad Autónoma de Madrid, Universidade de Lisboa. The main sponsors of such research include the National Institutes of Health, National Institute on Aging, Canadian Institutes of Health Research. The key magazines on the subject matter of the physical activity of senior citizens are the following, according to Scopus data: the International Journal of Environmental Research And Public Health, Journal of Aging And Physical Activity, Journal of The American Geriatrics Society.

A bibliometric literary review ensures added value in the management of information on the subject matter of the scientific output in a particular field of research by means of discovering the most productive countries and research institutions. Such an analysis presents the research system and illustrates the patterns of management of the scientific output. This facilitates the identification of the main authors, while also providing opportunities for scientists to find potential co-workers among the most prolific authors and making a choice of the magazines with the highest level of quality and source titles of their publications.

The limitation of this research is the analysis of only one bibliometric database and its restriction to the English languages. Unfortunately, among the bibliometric databases there is a lack of the uniformity of the possibilities and criteria of the accumulation and indexation of data (Urban, 2019). It would be interesting to repeat the research with bibliometric data taken from other databases, or even more so in terms of the records in other national languages than English. Perhaps in some Asian countries there are works associated with the activity of senior citizens. In almost every country the proportion of older people in the population is increasing. We know that a multitude of people (including senior citizens) in China practice Tai Chi. This is an area where it is well established that being active is essential for improving movement performance elderly (Milert, Klich, Ridan, Morgas, 2017). This is an area of the science physical activity review where more research is urgently needed. From a broader perspective generally, martial arts and sports is an area of the science physical activity review where more research is urgently needed (Buková, Zusková, Szeridová, Küchelová, 2017; Wąsik, Shan 2014; Liu, Kong, Wang, Shan, 2020). The majority of studies reported positive effects resulting from hard martial arts practice, showing some improvement and maintenance of balance, cognitive function and psychological health. Benefits may be obtained regardless of the age of practice commencement (Origua, Marks, Estevan, Barnett, 2017). The results and considerations presented in this work may contain material for comparisons for other researchers and may indicate the path for further

research of an interdisciplinary character. This research provides examples of striving towards the optimization of the psycho-physical functioning which will have a positive impact on the later stages of the life of an individual (including the elderly stage), which in turn may take multiple routes (Góra, Wąsik, 2014; Kmiecik, Bakota, Plomiński, 2020; Pivovarnik, 2016; Wąsik, 2010; Wąsik, Shan, 2015).

In the future, together with the development of “search engines and artificial intelligence” as a translator, it shall be possible to conduct such analysis with the aid of a very sophisticated method of calculation on the basis of all the available data from all the Internet databases (Golomb, Garg, Saha, Azzouz, Williams, 2008).

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