

# REVIEW ARTICLE

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## Does it pay to be active?

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SYLWIA PIOTROWSKA<sup>1</sup>, MARIAN MAJCHRZYCKI<sup>2</sup>, PIOTR ROGALA<sup>1</sup>, PATRYK GOŁĘBIEWSKI<sup>2</sup>

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### Abstract

**Introduction.** During their career athletes are at risk of injuries due to high-intensity training, overtraining, and untreated sports-related micro-injuries. As they advance in years, they experience the results of previous injuries. **Aim of Study.** The aim of the study was to evaluate the effects of physical activity and their changes on the quality of life in the old age. **Material and Methods.** A review of literature was performed with the use of keywords: “sport injuries”, “aging”, “quality of life”, “old age”, “former athletes”, “osteoarthritis”, “physical activity” in databases such as PubMed, SPORTDiscus, MEDLINE, Springer, Google Scholar. **Results.** Degenerative changes in the joints are far more common in former athletes than in the general population. Well-developed muscles resulting from sustained physical activity prevent limitations in daily life (including those resulting from degenerative changes). Degenerative changes caused by long-time sport activity have no significant effect on the quality of life in older people. **Conclusion.** Physical activity plays an important role in reducing physical deficits in everyday life of the elderly, thus contributing to improving their quality of life.

**KEYWORDS:** physical activity, injuries, old age, osteoarthritis, quality of life.

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Corresponding author: sylwia.piotrowskaa@gmail.com

<sup>1</sup> Poznań University of Medical Sciences, Clinic of Spine Surgery, Oncology Orthopedics and Traumatology, Poznań, Poland

<sup>2</sup> Poznań University of Medical Sciences, The Department of Rheumatology and Rehabilitation, Poznań, Poland

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### What is already known on this topic?

It is a commonly held view that moderate physical activity has health benefits, whereas lack of physical activity and extreme physical activity (such as in sports) have a detrimental effect on our health and quality of live in the old age.

### Introduction

Physical activity is an essential part of a healthy lifestyle [1]. Regular and moderate physical activity reduces the risk of many diseases and/or has a positive effect on the health of patients suffering from chronic diseases such as atrial fibrillation, type 2 diabetes, obesity, dyslipidemia, chronic heart failure, ischemic heart disease, or osteoporosis [2, 3, 4]. It helps control joint edemas and pain caused by joint inflammation [1].

It must be remembered that physical activity also includes competitive sports. Professional athletes are a special group of physically active individuals, because during their careers they are at a high risk of injuries due to high intensity of training, overtraining and sport-related micro-injuries [2, 5], which are not as common in other physically active groups, i.e. among individuals practicing sports for recreation [6].

**Aim of Study**

The aim of the study was to evaluate the effects of physical activity and the changes it has on the quality of life in the old age.

**Material and Methods**

The material for this study consisted of peer-reviewed articles from Polish and foreign journals. The articles were searched using keywords: “sport injuries”, “aging”, “quality of life”, “old age”, “former athletes”, “osteoarthritis”, “physical activity” in databases such as PubMed, SPORTDiscus, MEDLINE, Springer, and Google Scholar.

**Effects of sports activity on the human body**

High training intensity in athletes is aimed at achieving the best results in any given sports discipline. Professional athletes are expected to go beyond what is needed to maintain the ability to perform activities of daily living. The exceptional performance of athletes is associated with a high incidence of injuries for any given sports discipline (Table 1). Drawer and Fuller [6] reported that nearly half of the soccer players they questioned retired because of injury, where 42% were acute injuries and 58% chronic injuries.

**Table 1.** Most common stress fractures in selected sports. [Source: Cline S, Patel DR: Stress Fractures. In: Pediatric Practice: Sports Medicine]

Discipline	Fracture
Aerobics	fibula, tibia
Ballet	tibia
Baseball	radius, scapula, rib, patella
Basketball	patella, tibia, calcaneus
Soccer	tibia, metatarsus
Running	tibia, fibula, metatarsus, tarsus
Fencing	pubis bone
Gymnastics	vertebral arch
Volleyball	metacarpus
Swimming	tibia, metatarsus
Tennis	ulna, metacarpus

Kujala et al. [5] provided examples of typical sports injuries and health issues resulting from them later in life. For the most part, injuries result in degenerative changes [6, 7]. This applies to both the lower and

the upper extremities. The risk of developing early osteoarthritis of peripheral and spinal joints is highest in former athletes compared to the rest of the population [2, 7, 8, 9].

Maquirriain et al. [10] intended to evaluate and compare the incidence of early degenerative changes in the shoulder joint in former female tennis players. The mean age was 57.2 years. The results showed that one third of the players (and 11% of the controls) had osteoarthritic changes in their dominant shoulder, and a more detailed analysis showed that degeneration of the acromioclavicular joint was found in 55.5% of the subjects from the study group (27.7% in the control group).

Osteoarthritis can be a result of cruciate ligament rupture, intra-articular fracture, cartilage injury, and meniscal injury/surgery [5]. Early-onset osteoarthritis can be induced by the type, duration and the level of practiced sport [6, 11]. Long-term overloading of the joint can lead to injurious changes in the articular cartilage and joint’s supporting structures by changing the patterns of joint loading. Overweight is a risk factor in hip and knee osteoarthritis [12].

It is worth noting that the knee joint is the most vulnerable part of the body when it comes to injuries, and that knee injuries are the most common cause of physical disability in later life [5].

There are numerous theories regarding osteoarthritis. It is not clear whether it is a single disease or a set of dysfunctions in which similar symptoms coincide [12]. Typical osteoarthritis symptoms include limited range of motion, soft tissue pain (ligaments, tendons, articular capsule) and physical disability [6]. The symptoms intensify with age [12].

The well-developed functional muscles in athletes (through intensive physical activity at the young age) can prevent the consequences of osteoarthritis. They will compensate for the effects of degenerative changes, and delay and reduce deficits occurring at the old age [7, 8].

A study of former athletes by Hermette et al. [11], aiming to evaluate the relationship between long-time handball playing and passive hip range of motion, the development of radiological hip osteoarthritis and pain in the hip joint, showed that 60% of the study subjects had osteoarthritis in at least one of the hip joints, compared with 13% of the control subjects. The passive range of motion was significantly lower in the handball players. However, former athletes scored higher for abduction,

extension, and lateral rotation than the controls. This could be explained by movements that are specific to handball. A piece of information that seems relevant is that players with osteoarthritis experienced less pain during daily activities than subjects with osteoarthritis in the control group. The authors explain this by the fact that the experience of pain during the career of the athletes may increase the pain tolerance threshold.

### The quality of life in the old age

Ageing is a long and irreversible physiological process. During this process, starting between 25-30 years of age [13], the human body undergoes many changes. Functional changes affect structural changes, and the other way around causing a vicious circle. Sarcopenia (loss of muscle mass) is observed as well as dynapenia (loss of muscle strength) and the loss of fat-free body mass [14]. The ability to endure physiological loading is decreased [14]. Reduction in aerobic capacity in this period of life leads to lower quality of life [14]. Motor organs slowly undergo destructive changes.

Ageing is associated with the loss of motor neurons which innervate muscle fibers. A significant decline in neuromuscular function can be observed. Developed compensatory mechanisms are equivalent and lead to a situation where one nerve innervates several motor units. Impairment of coordination in older people can be a result of these compensatory mechanisms. The final result of the physiological mechanism described above is the stiffness and the weakening of muscles [15].

All those age-related changes inevitably lead to decreased physical fitness (even despite regular physical activity in the young age [16]), sometimes causing difficulties in performing the most basic everyday tasks [14].

Rejeski et al. [17] reported that physical activity had a significant effect on health-related quality of life [1]. The results of another study show that being physically active at an old age is associated with increased satisfaction with one's life, or – in other words – with one's quality of life [18]. Physically fit and physically active subjects reported less functional limitation than unfit or sedentary participants [19]. Not many elderly people actively pursue physical exercises, ignoring the mounting body of evidence showing that physical activity increases the quality of life.

A sedentary lifestyle, common among the large portion of older population, is an additional risk factor of developing functional limitations. The most felt

functional limitation in everyday life in older people is climbing up and down the stairs, which makes them dependent on other people. This is especially true for people with hip and knee osteoarthritis [12].

A study by Vingard et al. [9] on 114 athletes (aged 50-80 years of age) and a control of group of 335 people showed that despite the higher prevalence of degenerative changes in athletes (8% in athletes, 2% in the control group) 80% of sportspeople described the state of their health as good compared to 40% in the control group (Figure 1). A study by Turner et al. [20] on the quality of life of former soccer players in the United Kingdom (284 participants, the mean (SD) age of the respondents of 56.1) showed that almost half of the respondents had osteoarthritis (mean age of 40.4), and approximately 40% of them had osteoarthritis in at least three joints. Players diagnosed with osteoarthritis reported lower quality of life than those without osteoarthritis.

Proprioception is the sense of the relative position of one's body in the space. It consists of relations between motion and sensory pathways of the nervous system [21]. Its definition includes the position of joints and movement they make [12, 22]. This process is performed on two levels: conscious and unconscious [12]. The risk of injury is inversely proportional to the level of proprioception [21]. As people age an increase in proprioceptive impairment is observed [23]. A properly matched training program can positively influence the level of proprioception [22].

Marchewka and Jungiewicz [24] tried to answer the question: Does physical activity before the age of 30 has an effect on the quality of life at the beginning of the old age? They studied 59 people, aged 55 to 64 years. People who were physically active in their young age were shown to mark their current health higher and were better at performing everyday tasks. The results show the physical activity in the young age has a significant effect on the quality of life in the old age.

### HEALTH RELATED QUALITY OF LIFE HRQL

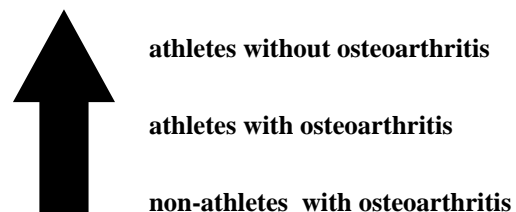


Figure 1. Health related quality of life (HRQL)

## Conclusions

- Physical activity carries numerous health benefits.
- Osteoarthritis is more prevalent and occurs earlier in former athletes than in the general population.
- Well-developed muscles due to continued sports activity prevent limitations in everyday life (also those caused by arthritis).
- Osteoarthritis caused by long-lasting sports activity is not associated with lowered quality of life in the old age.

Physical activity slows the ageing process and prevents its side effects [25]. The relative risk of mortality in physically active people is approximately 20 to 35% lower than in the physically inactive [1, 4]. Life expectancy in physically active persons is approximately 3.5 to 4.0-year higher compared to that in physically inactive persons [4].

Former athletes, despite sustained injuries and their consequences, rate their quality of life and state of health in the old age as the highest. This could be influenced by them being sports-conscious, the continuous progress of trauma surgery and rehabilitation methods which contribute to improved treatment of sports-related injuries, and prevention of functional limitations.

Physical activity plays an important role in reducing functional deficits of everyday life in older people and improves their quality of life.

### What this study adds?

The presented review systematizes the knowledge of the effects of physical activity on health and quality of life in the old age. Any kind of physical activity (even intensive one) is better than none.

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