

Effects of a six-month intervention program on physical functioning, quality of life, attitudes to ageing and assertiveness of older adults

PhD thesis

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“IT`S NOT HOW OLD YOU ARE, IT`S HOW YOU ARE OLD.”

(Jules Renard, 1894)



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1. DEFINITIONS AND ABBREVIATIONS

ACSM – American College of Sports Medicine

AHA – American Heart Association

APHA – American Public Health Association

Assertiveness refers to the ability to make requests, actively disagree; express personal rights and feelings; initiate, maintain, or disengage from conversations and to stand up for self (Kearney et al. 1984).

Aqua fitness is a full-body workout carried out in water, usually in a group with a qualified instructor for about an hour. It has two main versions: deep water and shallow water training. In shallow water training, the feet touch the bottom of the pool and shoulder level does not exceed water level. By the mitigation of gravity, water provides the safest medium for older individuals to do exercises. Less balance control is needed in this stable environment; therefore, the risk of injury is reduced to a minimum.

CDC – Centres for Disease Control and Prevention

Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness (WHO 2004).

Health The World Health Organization in 1948 defined as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"² (WHO 2006)

In 1986, the WHO, in the OTTAWA Charter for Health Promotion said that **health** is "a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities." Overall health is achieved through a combination of physical, mental, and social well-being, which, together is commonly referred to as the Health Triangle (WHO 1986).

Health related quality of life (HRQOL) "is the extent to which one's usual or expected physical, emotional, and social well-being are affected by a medical condition or its treatment" (Cella et al. 1995).

Inactive or sedentary: adults in our study are classified as inactive if they did not report any sessions of light to moderate or vigorous leisure-time physical activity of at least 3x30 minutes a week.

IOM – Institute of Medicine

Older adults: people over the age of 65

Physical Activity (PA) is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities (WHO 2004).

Physical fitness is a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests (WHO 2004).

Physical function refers to those physiological attributes, which support behaviours needed to perform everyday activities required for independent living: aerobic capacity, flexibility, strength, motor agility/dynamic balance.

Pilates - a physical fitness system developed in the early 20th century by Joseph Pilates, and became popular in many countries. Pilates is a full body workout that helps to build flexibility, muscle strength, and endurance in the legs, abdominals, arms, hips, and back. It concentrates on deep muscle workout, strengthens those muscles, which are responsible for the appropriate body posture. Breathing plays a crucial role in Pilates exercises.

Quality of life (QOL) "is the individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of

independence, social relationships and their relationship to salient features of their environment” (WHOQOL Group, 1995).

Regular PA is defined as doing moderate intensity exercise at least for 30 minutes three times per week.

ROM – range of motion

USDHHS – U. S. Department of Health and Human Services

Well-being: adaptive ability preparing for coping with the difficulties of life, ability to obtain a healthier choice, experiencing joyful health (emotional balance), ability to meet one’s needs and desires, to achieve "quality of life", personal prosperity, self-efficacy, harmonic social relationships, belonging to a community and to meet healthy and safe environmental conditions (WHOQOL Group 1995).

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4. INTRODUCTION

As more individuals live longer everywhere in the world, it is of paramount importance to maintain quality of life, functional capacity, and independence as they age. In almost every country of the world, the proportion of people aged over 60 years is growing faster than any other age group, as a result of both longer life expectancy and declining fertility rates.

This process, the ageing of the population can be regarded as a success story for public health policies and for socioeconomic development, but it is also a great challenge for the societies to adapt, in order to be able to increase the health and functional capacity of older people as well as their social participation and security.

The proportion of the world's population over 60 years will double between 2000 and 2050 (from about 11% to 22%). During the same period the number of people aged 60 years and over is expected to increase from 605 million to 2 billion (WHO 2014).

Latest projections indicate that the population aged 60+ in Hungary is expected to grow by about one million up to the middle of the century, to reach 2.941 thousand by 2050. This is expected to make up 33.6 percent of the total population projected.

At present there are about as many elderly as children in Hungary, in terms of age groups 60+ and 0-19. By 2050, there are projected to be at least 80 percent more elderly than children. This new phenomenon poses new challenges for the society (Hablicsek, 2004).

A lot of studies prove that regular physical activity contribute to a healthy aging process and is among the most important self-care behaviours that contribute for a healthy active living and for a quality of life (Sagiv, 2000, Morrow, et.al. 2004, Prohaska, et.al, 2006). As the average birth expectancy rate is also increasing, increased life span should not mean more years of ill health before death for an individual and a greater proportion of people with disability in our society.

Research also tells us that being active reduces the risk of such non-communicable diseases as heart disease, obesity, hypertension, diabetes, osteoporosis, depression as well as falls and injuries. (Pate et al. 1995, Petrella et al. 1999, Bailey 2000). Of course, there are a number of processes, which go together with the normal ageing process, but

many of them can be slowed down with regular physical activity and can result in healthy ageing. Prevention is crucially important, so preparation for a healthy old age therefore should start early in life. It is also notable, that older people, who had been inactive in the past, can develop a surprising degree of fitness with properly designed, graduated exercise. Those, who have always been active, can enjoy important benefits if they maintain their exercise over the long-term. It is said, that "because of their low functional status and high incidence of chronic disease, there is no segment of the population that can benefit more from exercise than the elderly" (Evans 1999).

We believe that the most important task of 'sport for the old' is to promote the importance of physical activity, show the possibilities of an active lifestyle to this fast growing segment of the population, help them to find the type of exercises suitable for their age and what they enjoy. Social advantages should also not be forgotten. Regular physical activity helps to prevent the undesirable mood changes and social isolation, which are unfortunately frequent problems among our senior citizens.

Sallis, et al. (1992) stated that "knowledge about health effects of physical activity are not important, but knowledge of how to be active may be a significant influence" (Sallis 1992).

Older people do not have to engage in highly rigorous physical activity to prevent or reduce the risk of diseases or falls. Moderate exercise, including walking and simple weight training, can be beneficial (Hoskins, Borodulin 2000).

Sad enough that the Hungarian society's state of health is much poorer than most of the EU countries'. We have a leading position in the number of coronary heart diseases, cancer, in addition, such as alcohol and smoking, and in inactive way of life. Every third person is a smoker and every seventh is an alcoholic (Hungarian Statistical Almanach, 2003).

In spite of the importance and actuality of the topic, relatively few studies focus on the older adults' way of life in the Hungarian literature. A study from Földesiné (1998) about the social factors, which influence women's participation in sport in the third age, can be mentioned as an exception (Földesiné 1998). Moreover, studies based on intervention programs, which are characteristics of the international sport scientific research in recent years, are missing from the Hungarian research. Only Barthalos and his colleagues conducted a 15-week intervention program in a twilight home in Győr to

assess the effects of physical activity on body composition and physical fitness of elderly women (Barthalos, 2009).

Ageing process is not similar at each individual; the process can be influenced and intervened up to a limit. 'Recently it is proved that basic genitival aptitudes can be changed by special lifestyle interventions' (Chodzko-Zajko 1996)

5. LITERATURE REVIEW

5.1. International and national data on population statistics

The phenomenon of a far-reaching demographic ageing is unique in the history of man. In only 25 years, the total population of older people (aged 60 and over) will increase from 605 million in the year 2000 to 1.2 billion in 2025. In a number of developed countries, there are already today more people aged 60 and over than there are children under 15. It is estimated that by the year 2030 persons 85 year and older will be the fastest growing segment of the population (Hoskins, Borodulin, 2000).

Hungary

According to the National Central Statistical Office in Hungary, every fifth person has already reached the age of 60. They approximate 20% of the total population, which means 2 million persons (HCSO 2008). From the next table (Table 1) it can be clearly seen that the percentage of elderly population has been constantly increasing from the year 2000, whereas the proportion of youth has been decreasing. It is estimated that by 2030 the rate of elderly population will be 1.5 times more than the young (aged less than 15).

Table 1 Percentage of youth (aged less than 15) and elderly (aged 65 and over) of the whole population in Hungary by OECD statistics (OECD 2011).

Year	2000	2005	2006	2007	2008	2030
Youth population (aged less than 15)	16.75	15.53	15.31	15.175	15.03	14.40
Elderly population (aged 65 and over)	15.06	15.70	15.87	16.1	16.29	21.54

5.2. Hungarians' lifestyle, with special interest to physical activity

The amount of regular sport activity done by the Hungarians is well below the EU average according to a representative survey conducted by the Public Opinion Analysis sector of the European Commission in 2009 (EU27 N=26.788; HU N=1.044), (Eurobarometer, 2009). (Figure 1) 77% of the entire Hungarian population can be regarded inactive, while they do not do physical activity more than three times per month.

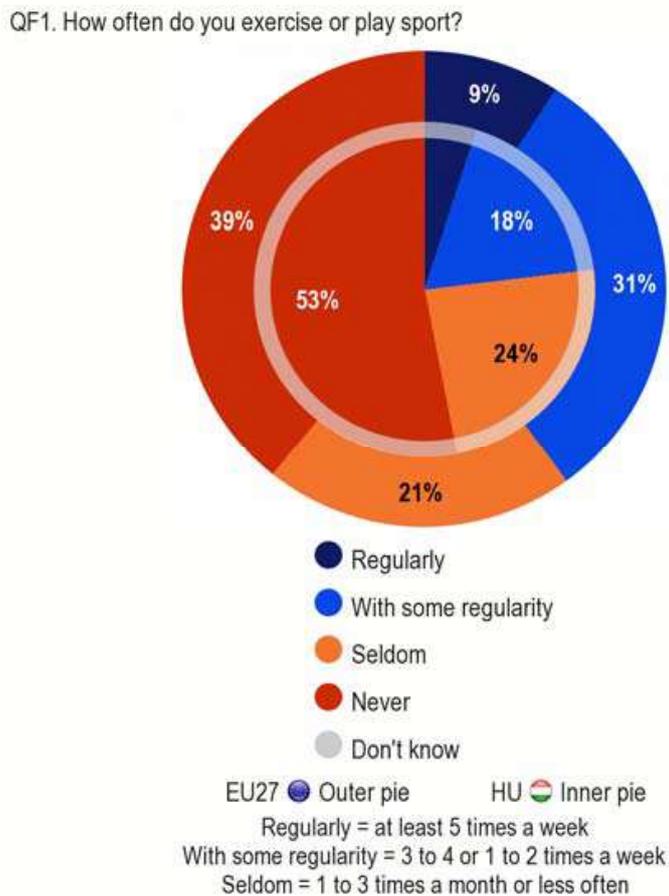


Figure 1 Regular exercise or sport activity done by 1. Hungarians – inner pie; 2. EU 27 countries - outer pie (Eurobarometer, 2009)

Unfortunately this proportion is the characteristics of all age groups, but the most considerable difference can be seen in the sporting habits of people aged over 55, where the amount begin to fall rapidly compared to the EU average. Only 5% of women and 3% of men do regular exercise (Eurobarometer, 2009). (Table 2)

Table 2 Frequency of exercise or sport activity done by Hungarians and EU country members in the different age and sex groups (Eurobarometer 2009)

QF1. How often do you exercise or play sport?

Answer: Regularly

 EU27
  HU

TOTAL	9%	5%
 Gender * Age		
Men 15-24	19%	11%
Men 25-39	9%	5%
Men 40-54	7%	2%
Men 55-69	10%	3%
Men 70+	8%	1%
Women 15-24	8%	6%
Women 25-39	7%	5%
Women 40-54	10%	4%
Women 55-69	11%	5%
Women 70+	7%	2%

Experts believe (Rétsági 2010, Gál 2011) that problems in Hungary begin in elementary school. Physical education classes are one-sided, not motivating enough and too burdensome, rather than teaching children how to be physically active on the long run and trying to make sport activities part of their everyday lives. The negative effects of the PE educational system can be felt in the sporting habits of young Hungarians between the age of 15-24 - 11% of males, and only 6% of females do regular sport activity, compared to the EU ratio of 19 and 8 per cent (Eurobarometer, 2009). (Figure 2)

Most of the Hungarians believe that sport refers to only competitive, high intensity sport activity, which is the privilege of young people. People, first of all the older generation, do not have opportunities to do sport with their contemporaries and 'sport for all' is unfortunately almost missing from the Hungarians' lifestyles. In Hungary, conditions are not provided for doing sports for seniors – whereas in Western countries entire industries are based on sport for the old.

A representative survey was conducted in Hungary by Gál and her colleagues, where very similar results were published. It was also found that although young women were

touched by the 'Fitness-wave' coming from the United States, most Hungarians do physical activity simply at home or at public areas, not in fitness facilities. Men remained by the more traditional sport arts - such as running, jogging, swimming, cycling – which can be arranged quickly and individually, and, of course, football remained the most popular and attractive sport among males (Gál 2008).

Sporting habits of people over 55 can be affected by their very poor health status in that age. They are suffering from many diseases, such as coronary heart disease, obesity, musculoskeletal disorders, just to mention the most frequent ones. One good solution or at least intention would be the general practitioners' recommendation on regular physical activity. This was one of the reasons why the Hungarian Society of Sport Science joined the "Exercise is Medicine" American project two years ago. In their first complex investigations, they analyzed the consequences and the interrelationships of the characteristics of inactive lifestyle that occurred even in young age groups in a broad age range sample (Szmodis et al. 2013).

5.3. How long do the Hungarians live – leading death causes

Despite recent positive changes, life expectancy in Hungary is still among the lowest in Europe, even lower than in other former Eastern bloc countries (table 3).

Table 3 Life expectancy at birth of the Hungarian population (number of years) (OECD 2011)

Year	2000	2005	2006	2007	2011
Life expectancy at birth: total	71.7	72.8	73.2	73.3	74.4
Life expectancy at birth: men	67.4	68.6	69	69.2	71
Life expectancy at birth: women	75.9	76.9	77.4	77.3	78.8

The most common causes of death

In this chapter, I would like to highlight the most common causes of death regarding the European Union and Hungary. It has to be noticed, that the risk of the three most common causes can be largely reduced by healthy lifestyle, especially by regular and appropriate physical activity.

Diseases of the circulatory system are related to high blood pressure, cholesterol, diabetes and smoking. Ischemic heart diseases accounted for 76.5 deaths per 100 000 inhabitants across the EU in 2010. The EU Member States with the highest death rates from ischemic heart disease were the Baltic Member States, Slovakia and **Hungary** – all above 200 deaths per 100 000 inhabitants in 2010. At the other end of the range, France (2009), Portugal, the Netherlands, Spain and Luxembourg had the lowest death rates from ischemic heart disease – below 50 deaths per 100 000 inhabitants in 2010.

Cancer was a major cause of death – averaging 166.9 deaths per 100 000 inhabitants across the EU in 2010. The most common forms of cancer in the EU in 2010 included malignant neoplasm of the larynx, trachea, bronchus and lung, colon and breast. **Hungary**, Slovakia, Poland, Slovenia, the Czech Republic, Latvia and Lithuania were most affected by this group of diseases – with upwards of 190 deaths per 100 000 inhabitants in 2010; this was also the case in Croatia. **Hungary** recorded, by far, the highest death rates from lung cancer among EU Member States in 2010 (71.3 deaths per 100 000 inhabitants), followed by Poland and Denmark (2009).

After circulatory diseases and cancer, *respiratory diseases* were the third most common causes of death in the EU, with an average of 41.2 deaths per 100 000 inhabitants in 2010. Within this group of diseases, chronic lower respiratory diseases were the most common cause of mortality followed by pneumonia. Respiratory diseases are age-related with the vast majority of deaths from these diseases recorded among those aged 65 or more.

External causes of death also have to be mentioned. This category includes deaths resulting from intentional self-harm (suicide) and transport accidents. Although suicide is not a major cause of death and the data for some EU Member States may suffer from

under-reporting, it is often considered as an important indicator that needs to be addressed or considered by society. On average, there were 9.4 deaths per 100 000 inhabitants resulting from suicide in the EU in 2010. The lowest suicide rates in 2010 were recorded in Greece and Cyprus. The death rate from suicide in Lithuania (28.5) was approximately three times the EU average, while rates in **Hungary** (21.7) were around double the average. Although transport accidents occur on a daily basis, the number of deaths caused by transport accidents in the EU in 2010 (6.5 per 100 000 inhabitants) was lower than the incidence of suicides (Eurostat 2012).

5.4. Aging theories and the aging process

Gerontology is the comprehensive study of the aging process and the problems of old people. The focus is on the human individual himself, while the main purpose is to increase the life span. (Semsei, 2008). As the aging process is a universal phenomenon, experimental gerontology is carried out on animal models as well. In this paper only human research is going to be discussed.

There are different theories of aging according to the relevant literature (figure 2) – evolutionary, programmed, damage, etc. (Kvell et al. 2011).

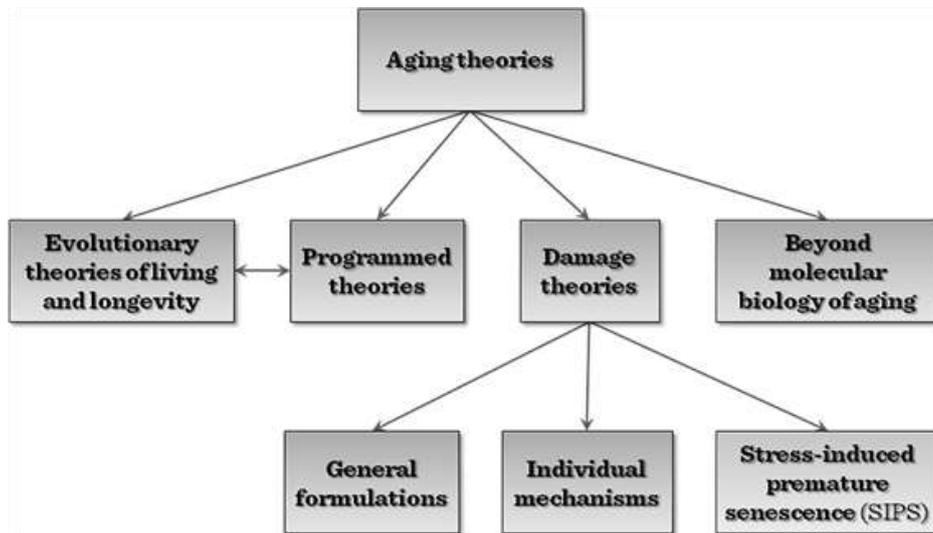


Figure 2 Aging theories (www.tankonyvtar.hu)

Semsei (2011) summarizes the most important aging theories in his study. It is said that the problems with the different aging models are that first of all they attempt to explain the complex and individually different aging process in general, and that they try to draw their conclusions from only one or two hypothesis. In Semsei's opinion, due to the differences in the aging process in various organisms, first the model of human aging should be outlined, because the process could be affected by many factors. External and internal factors all play a role, but most of all the internal information level of an organism is determinative, in association with adaptation to the external environmental factors

Another study found that the theoretical basis of *programmed theories* is that the process takes place according to defined genetic processes, so individual life span is determined by individual genetic background, environment and lifestyle (Radák, 2008). The population's life span is the sum of its members' individual lifespan, on which inactive lifestyle has a significant negative influence. Physical activity or with other words, motion is the basis of life: the Earth is moving, the blood-circulation sends the nutrients to the cells, so metabolism is based on continuous movement. Inactivity is completely unknown to the organism, and therefore may be the breeding ground of lifestyle-related physical illnesses.

It is very hard to define aging properly. First of all it starts at different times of individuals' lives. Although its signs can be noticed mostly after the age of 40, its exact date of beginning is hardly possible to tell (Semsei, 2008). It is well known that one key factor in the ontogenesis of a human being is his or her age. When the individual level of chronological age is compared to the *biological age* – it describes if the individual is in younger or older biological state than the average – significant differences can be observed within homogeneous populations. However, it can be stated that the concepts of aging and disease are often associated with each other, but as the external environmental factors and lifestyle can be influenced, we can slow down the aging process. Prevention plays a major role in delaying the development and progression of diseases associated with old age

Some age-related physical changes are obvious: wrinkles, greying hair, and additional weight around the midsection, for instance. Nevertheless, many changes, such as the gradual loss of bone tissue and the reduced resiliency of blood vessels, loss of sensory/motor neuron, and atrophy of type-II muscle fibres in particular, go unnoticed, even for decades.

Bone-related deteriorations: bones are deceptive - from the outside, they appear hard and stagnant, but are bustling with activity. The tough exterior conceals a vast network of blood vessels that transport nutrients to, and wastes away from, working bone cells. As time passes bones become thin and increasingly susceptible to fracture. As this process accelerates after age 50, osteoporosis becomes more common. Some bone loss with age is unavoidable, but the rate at which bone is lost is highly individual.

Much research proves that regularly performing weight-bearing exercise, such as walking and lifting weights, and getting an adequate amount of calcium and vitamin D can keep bones strong longer, building bone and reducing the risk of osteoporosis, even in the elderly (Bosković et al. 2013, Granacher et al. 2013).

Genetics plays a role in the development of osteoporosis -- Caucasian and Asian women are more likely to develop osteoporosis, as are those who have relatives with the disease. Menopause is also a culprit: bone loss accelerates in the five years or so after menopause.

Bad habits, such as smoking and excessive use of alcohol, also contribute to bone loss, as does a sedentary lifestyle and inadequate intake of calcium and vitamin D. Certain medications such as cortisone-like drugs and cholestyramine, a drug to lower blood cholesterol levels, also accelerate bone loss. So do some medical conditions such as rheumatoid arthritis.

600 thousand women and 300 thousand men are affected by osteoporosis in Hungary, which results in 80 thousand fractures per year. The individually tailored physiotherapy training on a regular basis decreases the risk of falls, and helps to maintain bone mass through appropriate osteoblast stimulation and increased muscle strength. Vertical forces to the spine can provide the necessary stimulates needed to achieve the desired effects. Professionally managed, every-day exercise are very important both in prevention and in the healing process of (vertebral) fractures (Somogyi 2007).

With increasing age, it is inevitable, that performance - regardless of exercise type - decreases. It can be primarily explained by the 10 percent aerobic capacity decline per decade, but other factors are also involved in the process. Maximal muscle strength and contractility are getting smaller as well. Oxygen consumption efficiency deteriorates in correlation with aerobic capacity (Apor 2013). An additional reason for that is although the number/volume of fibres II - anaerobic, fast - decrease with age, but during the relatively intense muscle activity they also have to be activated, which in turn leads to poorer overall efficiency. From among those attempts for improving this efficiency, strength training with increasing weight was proven the most effective (Saunders et al, 2004).

Disturbance of the mental processes, such as the loss of cognitive function, memory disturbances, dementia, are due to the hypo function of the brain centres, that is they are

used less and less as time passes. There is evidence that genetic factors may influence only 35% of the mental aging processes, in 65% environmental factors, individual lifestyle and a number of such factors are responsible, that can be controlled and changed.

Another major reason of mental deterioration is that the brain cannot store oxygen and glucose. The appropriate oxygen and glucose transport to the brain is able to prevent deterioration in central nervous system functioning even in old age. This requires a healthy cardiovascular system, which can be developed by regular physical training. Dustman and White (2006) have demonstrated that deficient cardiovascular function is detectable using EEG and MRI in the central nervous system, and abnormal EEG increases the incidence of cognitive dementia. Older people engaged in regular aerobic exercise had better met the neurophysiologic tests (speech, intelligence, reaction time, cognitive testing) than their sedentary counterparts (Dustman and White 2006).

In conclusion it can be stated that the organic changes occurring during the aging process impair the quality of life of older people, limiting their independence in life. A number of longitudinal and cross-sectional studies confirm that through regular exercise the physical and mental health functional deterioration can be postponed to a later date

5.5. Influential factors of participation in regular PA

Understanding the correlates of PA serves several purposes. The study of nonmodifiable correlates of PA (e.g., age, gender, and race) allows identification and targeting of subgroups that are least active, at greatest risk of adverse health outcomes, and in greatest need of tailored PA programs. Knowledge of modifiable correlates, e.g. attitudes, can guide the development of interventions to change PA behaviour (Prohaska et al, 2006). Researchers have found considerable variation within diverse older populations (e.g., by ethnicity, gender, age, chronic disease) for type and level of PA. For example, leisure-time PA (engagement in any hobbies, sports, or exercise in preceding 2 weeks) is greater among younger (aged 60 to 69) than older (aged 70 years and older) adults, higher among older men than women (Centres for Disease Control and Prevention (CDC 2004), and greater among white than black or Hispanic adults (Federal Interagency Forum, 2004). Similarly, a greater percentage of persons with

arthritis, especially those with disabling arthritis, are sedentary compared with persons without arthritis (CDC, 1997). Studies investigating participation in research have found that older adults who refuse to take part tend to be older, male, and come from lower socioeconomic groups (Wilson, Webber 1976). Conversely, those who agree to participate appear to be generally younger, more highly educated, and more likely to report healthier patterns (O'Neill et al. 1995). The PALS study, conducted in Western Australia in 2006, found that males have been shown to be more resistant to recruitment into research studies and into walking programs in particular, with data indicating that more females walk for recreation and transport. Interestingly, the PALS study attracted a greater proportion of "obese" older adults (27%) relative to the state average and when compared to the controls ($P < 0.05$) (Jancey, 2006). This is in contrast to previous findings that research tends to recruit healthier individuals (Klesges, Williamson, Simes et al 1999).

Studies that have included older minority groups have generally concluded that ethnicity has no significant bearing on exercise participation once other factors such as health status, exercise beliefs, and demographic characteristics are taken into account (Arean, Gallagher-Thompson 1996).

Previous research has found that it is more difficult to recruit less educated people into health research programs (Wilson, Webber 1976; Arean, Gallagher-Thompson 1996). To overcome the problem, the PALS program ensured that recruitment was conducted equally in high, medium, and low socioeconomic status neighbourhoods according to SEIFA values. Nevertheless, the PALS group still consisted of a larger proportion (27%) of tertiary educated people when compared to the state average (8%)

A study trying to find explanation of older adults' intention and self-reported physical activity used the Theory of Planned Behaviour (TPB) and the TPB with functional ability. The TPB is a conceptual framework, which is intended to predict PA behaviour. As a result of their study, they concluded that functional ability was an important predictor of self-reported PA and had the greatest influence on PA behaviour. Functional ability also demonstrated significant direct and indirect effects on PA intention. Based on the findings of this study, improving attitude toward PA, facilitating intention to participate in PA, and incorporating activities that improve functional

ability may be beneficial in promoting and implementing a PA program for older adults (Gretebeck et al. 2007).

5.6. Different health outcomes of regular physical activity

Nowadays, a considerable amount of data suggest that exercise and physical endurance are largely related to the rate of decline in combined, and different by reason deaths and to the slight increase in life expectancy (Blair 1997, Prohaska et al. 2006).

A large number of observations meet the interpretations that in the reduction of mortality and in longer life expectancy physically active lifestyle plays an important role as the independent variable. It seems that if middle-aged men before in their lives moved regularly or gradually moved over to regular physical activity, the more likely it is that they were going to live longer as if they physically had remained passive. Those men between the ages of 35 and 39, who has sedentary job, but burn more than 2000 kcal per week in leisure time (this can be reached by a mild-intensity exercise performed regularly), can hope for a 2.51 years longer life expectancy, as men of similar age who burns less than 500 kcal of total per week. Between 55 and 59 years, this difference is declined to 2.02 years, while 65 and 69 years the difference between the two groups is only 1.35 years (Paffenberger et al. 1986). The increasing life expectancy, which can be derived back to more active lifestyle, comes probably from the effect that regular PA reduces the risk of chronic conditions such as coronary heart disease, hypertension, colon cancer, type 2 diabetes, and osteoporosis (USDHHS 1996) and that these benefits extend into old age (Cavanagh et al. 1998). Evidence-based reviews have concluded that PA may help prevent hypertension (Kokkinos, Narayan, & Papademetriou, 2001), and improve insulin resistance in non-diabetics and persons with type 2 diabetes (Ryan 2000). Findings from the Nurses Health Study indicated that PA is associated with lower risk of stroke (Hu et al. 2000). A review of prospective cohort studies has also linked PA to increased longevity (Oguma, Sesso, Paffenbarger, & Lee, 2002) and decreased mortality due to coronary heart disease (Fraser, Shavlik 1997).

5.6.1. Effects of regular physical activity on physical health

Blair (1997) found that even moderate weekly exercise could substantially reduce a person's risk of early death. Coronary heart disease accounts for about 27% of the 21 million deaths each year among Americans. Studies typically have shown that sedentary people are about twice as likely to die from a heart attack as are people being physically active. By sedentary, researchers mean individuals who either do no purposeful physical activity or who exercise irregularly (i.e., less than three times a week, less than 20 minutes at a time, or both).

Individuals with certain medical conditions or disorders are also highly recommended to be engaged in appropriate, complex regular physical activity programs. Participation in a PA exercise program is proved to improve the functional performance of functionally impaired older people (Barnett, Smith, Lord, Williams & Baumand, 2003).

Hypertension was identified as one of the independent risk factors of cardiovascular diseases. As the results of a large number of controlled studies, the American Sports Medicine University published a position paper in 1998 arranging the possible positive effects of exercise in the treatment and primary prevention of hypertension (ACSM, 2009). Positive impacts of exercise applicable in prevention are based on the evidence obtained in animal experiments and epidemiological trials, and generally are supported by those hypotheses, according to which regular physical activity reduces the risk of hypertension (Nelson et al. 2007).

For example, at the Harvard University (USA), according to a study conducted among men who were actively engaged in sport activity the incidence rate of hypertension was 35% lower during a 6-10 years period than at similar inactive men.

Similarly, in the Cooper Institute for Aerobic Research, a 4-year follow-up period in physically trained men and women showed that the turning rate of hypertension was about 52% lower in the case of the trained than in the case of the untrained (Blair 1997).

It was reported by Kokkinos and his colleagues that regularly performed mild to moderate intensity physical activity lowers blood pressure by approximately 11/8 mm Hg. (Kokkinos, Narayan, and Papademetriou 2001). These findings were supported by similar blood pressure differences between fit and unfit individuals during a twenty-four hour blood pressure monitoring.

A sixteen-week long exercise program resulted in a significant reduction in resting and exercise blood pressure (Kokkinos, Narayan, Colleran 1995).

Osteoporosis is one of those musculoskeletal disorders that give many older people, especially women barrier in their mobility and so their daily lives are substantially affected (Vuori 1995, Karinkanta et al, 2012). Osteoporosis produces reduced bone mass and micro structural deterioration of bone tissue, which increases the risk of trauma fractures, mainly in the population of postmenopausal women (Bálint, Bors & Szekeres 2005). The most common clinical complications of osteoporosis are hip, wrist, and vertebral fractures, which are associated with a high degree of morbidity and mortality, resulting in disability or a reduction in the performance of activities of daily living (Zunzunegui et al 2011, Somogyi 2007). High-intensity power training is proved to provide substantial improvement for the hip, trochanter, and lumbar spine bone mineral density (Villareal et al, 2004).

5.6.2. Effects of regular physical activity on mental/psychological health

Although indirect improving role of PA on subjective well-being and QOL by reducing the risk of different diseases are proved, recently there has been increasing interest in its direct preventive role in mental health problems.

Aging is associated with many losses (e.g., loss of spouse, home, income, work, family roles, health, friends, and independence) that often lead to isolation, loneliness, depression, low self-concept, and a deprivation of basic psychological needs. In fact, depression is the most common mental health disorder among the entire senior population (Blazer 1994, Henderson 1994).

Although the failure to satisfy basic psychological needs can be detrimental to emotional and physical health at any age, it is of particular concern among the elderly population. There is clearly a need to examine the relationship between exercise and psychological well-being. The most obvious psychological benefit of exercise is the immediate elevation of mood (Sime 1990). This is particularly helpful in older people who may be prone to anxiety and depression. The elevation of mood, in turn, can have a favourable effect upon perceived health. By elevating mood and improving perceived health, an exercise program allows older persons to live with minor aches and pains,

thereby reducing the demand for medical services and increasing their level of independence (Thayer 1996).

Quality of life

QOL of older adults is particularly important in our aging societies, and many scholars argue that it is better to have QOL than a long life of low quality (Gems, 2003). It is a major public health concern to maintain quality of life through the whole lifespan, and also in clinical perspective, to improve lost quality of life for people suffering from chronic diseases or going through rehabilitation. There has been numerous research on QOL of older adults in the recent two decades (Bryant et al. 2002, Garrido et al. 2003, Hwang, Liang, Chiu, Lin 2003, Sousa, Galante, Figueiredo 2003), and also on the relationship between physical activity and QOL (Beniamini et al 1997, Ettinger et al. 1997, Stewart et al. 1997). QOL encompasses the concept of health related quality of life (HRQOL), which refers to the extent to which one's usual or expected physical, emotional, and social well-being are affected by a medical condition or its treatment (Cella & Bonomi, 1995).

Rejeski and his colleagues reviewed critically the literature on PA and QOL, in which the concept is given attention from two different prospective: 1. as a psychological concept, which is represented by satisfaction with one's life; 2. a clinical and geriatric outcome represented by the core dimensions of health status (as an umbrella term), which is HRQOL (Rejeski & Mihalko, 2001). In our recent study QOL is a psychological concept and measured by the short form of a commonly used QOL instruments, the WHO Quality of Life Questionnaire (WHOQOL). This shorter form was especially developed for the elderly – the WHOQOL-OLD.

In many studies HRQOL is measured on clinical populations, less deals with the concept in connection with healthy older adults (Comerota et al. 2000, Lehrner 1999, Wei et al. 2000).

Work in HRQOL has originated from two fundamentally different approaches: health status and health value or health preference assessment. In general, health status measures describe a person's functioning from one or more aspects (e.g., physical functioning or mental wellbeing). Currently, one of the most commonly used generic health status instruments (i.e., the concepts are not specific for any age, disease, or

treatment group) is the Medical Outcomes Study 36-Item Short Form (SF-36). It is a 36-item measure, encompassing 8 aspects – physical functioning, social functioning, mental health, role limitations due to physical problems, role limitations due to emotional problems, vitality (energy and fatigue), bodily pain, and general health perceptions – each of which is scored separately from 0 (worst) to 100 (best) (Lima 2009).

There is no clear agreement on the variables that are considered important for people in this age group, there is no theory of QOL for older adults, and there has been little research comparing countries and/or cultures.

Quality of life show strong relationship with health status. Health and functional status are two variables that are often found to explain QOL of older adults. In a review on perceived health of older adults and QOL, Moore, Newsome, Payne, & Tiansawad (1993) reported that for 11 of 17 studies, there was a strong positive relationship between these two variables. Raphael et al. (1997) also reported a positive relationship between QOL and health status of older adults.

The above-mentioned results suggest that regular physical activity improve general health status that contribute to maintain or even to improve quality of life in old age.

Attitudes to Ageing

Ageing-related attitudes are important determinants of older people's life expectancy and quality of life. Social connections, adaptation to their actual physical state, a healthy, active lifestyle, healthy diet and a positive attitude to aging are very important factors in lives of the elderly. According to Laidlaw, results of successful aging can be used effectively by professionals in orienting elderly patients towards a proper way of life (Laidlaw 2003).

Ageing is still largely characterized by loss. There are many prejudices and preconceptions against older people among the young, which are accepted as facts and ultimate truth. Old age is identified with weakness and degradation rather than wisdom and maturity. This unilateral approach can be expected to change from screening the quality of life and attitudes to ageing of older people. If older people themselves are asked, as experts of their own situations, surprisingly many of them have more

favourable personal experiences than could be expected (Laidlaw 2006). In conclusion, the WHO's research group for older people's quality of life besides quality of life measurement scale, considered it necessary to developed simultaneously the attitudes to aging questionnaire.

Assertiveness

Assertiveness involves a proactive response in difficult situations to contrast with passive or aggressive reactions (Rakos 1991). Although meanings of assertiveness vary considerably, a core definition entails calm, direct, honest expression of feelings and needs (Rakos 1991; Wilson & Gallois 1993). Assertive behavior can lead to positive self-concept and greater likelihood of meeting personal needs (Doty 1987). Assertiveness training has been extended to groups such as women, people with disabilities, and older adults (Doty 1987, Rakos 1991, Northrop & Edelstein 1998). Because assertive behaviour can be interpreted as aggressive or selfish, it is associated with risks. Wilson and Gallois (1993) indicate that assertiveness is often associated with lower ratings of friendliness and appropriateness. They interpret this typical finding in terms of confusion between aggression and assertiveness and restrictive role expectations for members of particular social groups (e.g., women, medical patients). Whether assertiveness is effective depends on its appropriateness in the specific situation. Lack of attention to contextual specificity is one reason for limited transfer to real life situations after assertiveness training (Rakos 1991, Wilson & Gallois 1993). Assertiveness is strongly associated with masculinity and with younger cohorts (Rakos 1991, Wilson & Gallois, 1993). Older people are less assertive than younger peers are, because they never were as assertive and because they may have lost the confidence to use assertiveness skills (Furnham & Pendleton, 1983). Given that non-assertive behaviour is encouraged in hierarchical societal institutions such as health care, assertive behaviour in health care encounters may be labelled as aggression. Yet, older patients with disabilities may have much to gain from learning assertiveness skills adapted for specific contexts (Orr & Rogers 2003). To illustrate, members of disadvantaged groups received more careful medical diagnostic investigations when they behave assertively (Ryan, Anas, and Friedman 2006).

5.7. Regular PA and the old – what and how much is recommended?

In 1995 the Centres for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) published a preventive recommendation that "Every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week." Subsequently, ACSM and the American Heart Association (AHA) issued the updated version of this recommendation (Haskell et al. 2007). In 2007 a panel of scientists with expertise in public health, behavioural science, epidemiology, exercise science, medicine, and gerontology, after reviewing these publications, issued a final recommendation on physical activity for older adults (Nelson et al. 2007). Their main purpose was to issue a recommendation on the types and amounts of PA needed to improve and maintain health in older adults. In this paper there are several important differences compared to the updated version of ACSM/AHA recommendations, e.g. activities that maintain or increase flexibility are recommended, balance exercises are recommended for older adult at risk of falls, etc. The recommended types and amount of exercises are summarized in Table 3.

Table 4 ACSM/AHA recommendations for exercise

Exercise	Aerobic physical activity		Muscle strengthening activity	Activity increase/maintain flexibility	Activity improve/maintain balance
	moderate-intensity	vigorous intensity			
Intensity	30 min.	20 min.	8-10 exercises	10 min.	
Duration	5 days/week	3 days/week	2 days/week	2 days/week	
Frequency			10-15 repetitions/exercise		

5.7.1. Aerobic endurance

Aerobic exercise has long been an important recommendation for those with many of the chronic diseases typically associated with old age. These include non-insulin dependent diabetes mellitus or NIDDM (and those with impaired glucose tolerance), hypertension, heart disease, and osteoporosis. Regularly performed aerobic exercise increases $V \cdot O_{2max}$ and insulin action.

The responses of initially sedentary young (age 20-30 yr) and older (age 60-70 yr) men and women to 3 months of aerobic conditioning (70% of maximal heart rate, 45 min·d⁻¹, 3 d per week) were examined by Meredith et al. (Meredith, Zackin, Frontera and Evans, 1987). They found that the absolute gains in aerobic capacity were similar between the two age groups. However, the mechanism for adaptation to regular sub maximal exercise appears to be different between old and young people.

There appears to be no attenuation of the response of elderly men and women to regularly performed aerobic exercise when compared with those seen in young subjects. Increased fitness levels are associated with reduced mortality and increased life expectancy. It has also been shown to prevent the occurrence of NIDDM in those that are at the greatest risk for developing this disease (Helmrich, Ragland, Leung, and Paffenbarger Jr. 1991). Thus, regularly performed aerobic exercise is an important way for older people to improve their glucose tolerance.

5.7.2. Muscle strength training

Although endurance exercise has been the more traditional means of increasing cardiovascular fitness, strength or resistance training is currently recommended by the American College of Sports Medicine as an important component of an overall fitness program. This is particularly important in the elderly, in whom loss of muscle mass and weakness are prominent deficits.

Evans, W. J. experienced in a randomly assigned high-intensity strength-training program in a population of 100 nursing home residents that it resulted in significant gains in strength and functional status. In addition, spontaneous activity, measured by activity monitors, increased significantly in those participating in the exercise program whereas there was no change in the sedentary control group (Evans 1999).

Their data suggested that changes in body composition and aerobic capacity that were associated with increasing age might not be age-related at all. By examining endurance-trained men, they saw that body fat stores and maximal aerobic capacity were not related to age but rather to the total number of hours, these men were exercising per week.

Improving muscle strength can enhance the capacity of many older men and women to perform many activities such as climbing stairs, carrying packages, and even walking.

Recently, Latham, Bannett, Stretton, and Anderson (2004) completed a systematic review that suggested that although RT has a large positive effect on strength, it has only a small to moderate effect on functional ability, and increases in strength do not necessarily translate into improvements in active daily living (Hazell T, Kenno K, Jakobi J. 2007). A variety of studies indicate that muscle power is more strongly related than muscle strength to increases in performance of ADL (Bassey et al. 2000, Foldvari et al. 2000, Miszko et al. 2003, Louis 2012).

5.7.3. Flexibility activities

Flexibility activity is recommended to maintain the range of motion necessary for daily activities and physical activity. Unlike aerobic and muscle strengthening activities, specific health benefits of flexibility activities are unclear. For example, it is not known that flexibility activities reduce risk of exercise-related injury (Thacker et al. 2004). In

addition, few studies have documented the age-related loss of range of motion in healthy older adults. However, flexibility exercises have been shown to be beneficial in at least one randomized trial and are recommended in the management of several common diseases in older adults (King et al. 2000).

5.7.4. Balance exercise

To reduce risk of injury from falls, older adults with substantial risk of falls should perform exercises that maintain or improve balance. Physical activity, by itself, may reduce falls and fall injuries as much as 35-45% (Robertson et al. 2002). Because research has focused on balance exercise rather than balance activity (e.g., dancing), only exercise is currently recommended. (American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001). The preferred types, frequency, and duration of balance training are unclear. Balance exercise three times each week is one option, as this approach was effective in a series of four fall prevention studies (Robertson et al. 2002).

5.8. Pilates and Aqua fitness training

Pilates

According to the updated version of the ACSM/AHA recommendations, not only aerobic exercise and resistance training, but also flexibility exercise and balance training are important parts of an overall fitness program. As Pilates exercises, supplemented with aerobic endurance workout, fit well with these guidelines, these were chosen for one of the exercising group. Another reason for our choice was that the program leader is a qualified Pilates instructor, who is familiar with the implementation and effects of the exercises.

The Pilates method was developed by Joseph Pilates in the early 20th century. He called his method Contrology, because he believed his method used the mind to control the muscles during exercise. The program focuses on the core postural muscles that help keep the body balanced and which are essential to support the spine (Pilates & Miller, 1945). A recent study conducted by Kloubec (2010) suggested that individuals can

improve their muscle endurance and flexibility using relatively low intensity Pilates exercises.

Proponents of Pilates exercises claim that regular practice leads to relaxation and control of the mind, enhanced body- and self-awareness, improved core stability, better coordination, more ideal posture, greater joint ROM, uniform muscle development, and decreased stress (Lange et al. 2000). The first modern book on Pilates, *The Pilates Method of Physical and Mental Conditioning*, was published in 1980 by his students (Friedman, Eisen 1980) and in it they outlined the following six "principles of Pilates":

Concentration

Pilates demands intense focus: "You have to concentrate on what you're doing all the time. And you must concentrate on your entire body for smooth movements." (Friedman, Eisen 2005). This is not easy, but in Pilates the way that exercises are done is more important than the exercises themselves.

Control

"Contrology" was Joseph Pilates' name for his method and it is based on muscle control. "Nothing about the Pilates Method is haphazard. The reason you need to concentrate so thoroughly is so you can be in control of every aspect of every moment." (Friedman, Eisen 2005) All exercises are done with control with the muscles working to lift against gravity and the resistance of the springs and thereby control the movement of the body and the apparatus. "The Pilates Method teaches you to be in control of your body and not at its mercy." (Friedman, Eisen 2005)

Centering

The starting place of the movements in the body is called the centre. Pilates teachers refer to the group of muscles in the centre of the body—encompassing the abdomen, lower and upper back, hips, buttocks, and inner thighs—as the "powerhouse." All movement in Pilates should begin from the powerhouse and flow outward to the limbs.

Flow

Pilates aims for elegant sufficiency of movement, creating flow through the use of proper transitions. Once precision has been achieved, the exercises are intended to flow within and into each other in order to build strength and endurance (Friedman, Eisen 2005)

Precision

Precision means concentration on the correct movements each time when exercise is done. The focus is on doing one precise and perfect movement, rather than many ones of poor quality. Pilates is here reflecting to the common physical culture wisdom, that more can be gained from a few energetic, concentrated movements than from a thousand listless, sloppy movements (Pilates, Miller 1945).

Breathing is important in the Pilates method. In *Return to Life*, Pilates devotes a section of his introduction specifically to breathing. In Pilates exercises, the practitioner breathes out with the effort and in on the return. In order to keep the lower abdominals close to the spine; the breathing needs to be directed laterally, into the lower rib cage. Pilates attempts to properly coordinate this breathing practice with movement, including breathing instructions with every exercise (Pilates, 1945).

Powerhouse

Students are taught to use their “powerhouse” throughout life’s daily activities. According to Joseph Pilates, the powerhouse is the centre of the body and if strengthened, it offers a solid foundation for any movement. This power engine is a muscular network, which provides control over the body and comprises the entire front, lateral and back muscles found between the upper inner thighs and arm pits (Friedman, Eisen 2005)

Precautions

Safety is always involved in every aspect of the Pilates workout, therefore there are precautions, modifications and protocols developed over decades within the knowledge of Pilates itself, that a fully qualified Pilates instructor should know and follow when

working-out people with certain conditions, e.g., during pregnancy, after birth, or with specific issues with their body (Friedman, Eisen 2005).

Aqua fitness

Aqua fitness or aqua aerobic is a full-body workout implemented in water. It can be carried out in shallow or in deep water. Most water aerobic classes are carried out in group setting with a trained professional teaching for about an hour. The main focus is on aerobic endurance, resistance training, and creating an enjoyable atmosphere with music. For elderly people it is one of the safest ways to do exercise, because of the mitigation of gravity. Water also provides a stable environment for elderly with less balance control and therefore prevents injury, and it can prevent overheating through continuous cooling of the body. Older people are more prone to arthritis, osteoporosis, and weak joints, and training in water provides an appropriate medium for exercising with these conditions as well. Research studies tell us about the benefits the elderly can receive by participating in water aerobics (Fisken et al. 2014, Rica et al. 2013, Ruoti 1989, Waters & Hale, 2007).

In recent years, aqua-aerobic has also been classified as physical activity improving the psychophysical well-being. It stimulates the cardio respiratory system by increasing the oxygen demand and by maintaining it for longer time, as well as by shaping muscle strength and endurance irrespectively of water depth. Shallow water training was applied in our intervention, when the feet touch the bottom of the pool and water level does not exceed shoulder level (Piotrowska-Całka 2007).

Our pre-study about the physical activity habits of older population in Eger showed that 40% of physically active older people go to swimming pool at least three times a week (Vécseyne et al. 2007). As Eger is famous for its curative water and traditionally a bathing town, we wanted to benefit from local facilities and customs. Additionally, there is potential discount from the entry fee for the retired in the swimming pool three times per week.

5.9. How to develop a successful intervention?

In the field of health promotion programming there is "no best way" to accomplish a specific health promotion goal which can be generalized across all sites and settings. The American Public Health Association (APHA) in 1987 developed a set of criteria intended to serve as guidelines for establishing the feasibility and appropriateness of health promotion programs in a variety of settings (APHA 1987). In 2001, the Institute of Medicine (IOM) also issued recommendations how to develop successful and effective interventions (IOM 2001). Prohaska and his colleagues based on the APHA and IOM reports, proposed criteria organised into three levels: individual, programmatic and environmental (Prohaska et al. 2006). In this chapter, we would like to present the main points of the mentioned reports.

Both reports considered it essential to address specific risk factors, facing the targeted age group. Data on the prevalence of specific health conditions and risk factors should be carefully gathered and prevalence of a risk factor relative to other risk factors among the target population is an important consideration. In the case of older adults, the IOM suggested that interventions aimed at increasing self-efficacy and social supports are particularly promising. Prohaska and his colleagues mentioned this criterion at the individual level of planning.

The IOM emphasises that "the interventions should be based on an ecological model. That means that the health-status and well-being of men are affected by dynamic interaction among biology, behaviour, and environment. This model also assumes that age, gender, race, ethnicity, and socioeconomic differences shape the context in which individuals function, and therefore directly or indirectly influence health risks and resources" (IOM 2001). These demographic factors are critical determinants of health and well-being and should receive careful consideration in the design, implementation, and interpretation of the results of interventions.

The APHA report mentions the reflection of the special needs and characteristics of the target group as the second criterion. An important consideration is whether the target group members can reach the proposed intervention. Here the problem of access – physical location, time of day when offered, - program affordability, as well as those, which provide incentives to program participation, should be taken into consideration.

Herewith we would like to mention the RE-AIM framework, which is a model for evaluating a public health intervention and assesses five dimensions: reach, efficacy, adoption, implementation, and maintenance (Russel et al. 1999). "Reach" is approached from the other side – here it means the percentage of persons who receive and/or are affected by a program and measured by comparing records of program participants and complete sample information for a defined population. At this point, the model emphasises the reach and representativeness of both participants and settings. Selection of communities that are most motivated, organized, and prepared for change results in expert, highly motivated, research teams and settings, which are unrepresentative of the settings to which their results are to be applied. It is important by all the mentioned papers that the program is effective for the chosen risk factor for the target population, and that physiological, behavioural, quality of life and participant satisfaction outcomes can be assessed. Behavioural change is a difficult and complex challenge. Attention should be given not only to the individual in program planning, but also to the environmental context within which people live. Long-term maintenance of behavioural change is a major challenge both at individual and community level. Brief changes in PA with quick relapses to sedentary behaviour are of little value. As environmental factors are important to focus on, the optimum use of available resources, including personnel should be identified as well.

5.10. Intervention programs for the elderly - review

Many of those studies, which focus on the relationship between regular physical activity and healthy aging, its effects on physical performance, cognitive and psychological functioning are based on intervention programs (Byfield 2001, Fiskens et al. 2014, Oken et al. 2006, Waters & Hale 2007, Wellmann et al. 2007). Most of these studies show significant improvement in old sample's physical functioning as the result of becoming physically active for a certain period of time. The dependence of psychological well-being on physical changes are not always so clear (Byfield 2001, Netz et al. 2005). Herewith I would like to review the most important studies from the prospective of our intervention program.

A pilot study conducted by Waters and Hale (2007) which consisted of 12 week aquatic exercise program, measured gait and balance changes in older adults (70,55 +/- 3,6

years). It provided evidence of potential benefits of aqua aerobic on dynamic balance and participants reported a range of perceived physiological and psychical advantages. A longer intervention and follow-up was recommended to determine additional functional and other outcomes (Waters & Hale, 2007). Another 12 week intervention was applied by Ruoti to determine metabolic and cardiovascular effects of an aqua dynamic exercise program. It was concluded that an aqua dynamic exercise program is an effective mean of obtaining a training effect for older individuals and also that water may eliminate the effects of gravity, water resistance offers enough mechanical work to offset the effect (Ruoti 1989).

In a study done in Brazil (Rica et al. 2013) the effects of short-term water aerobics was tested. Although it did not conclude exactly as planned, their test subjects did experience improved aerobic capacity, muscle endurance, and better overall life quality. The latest study, published by Fiskens and his colleagues (Fiskens et al, 2014), compared the effects of a traditional aqua exercise program (exercises were done seated in warm water) and the effects of aqua fitness for twelve weeks with older adults with osteoarthritis.

They found significant improvement in the Falls Efficacy Scale scores in the aqua fitness group compared with the control group. Within-group analysis indicated that both groups significantly improved their 400-m walk time and that the aqua fitness group significantly improved their step tests and the quality of life questionnaire total score. They could conclude that Aqua fitness may offer a number of positive functional and psychosocial benefits for older adults with osteoarthritis, such as a reduced fear of falling and increased ability to perform everyday tasks.

A study conducted by Kloubec (2010) used basic Pilates mat routines in middle-aged men and women to determine its effects on abdominal endurance, hamstring flexibility, upper-body muscular endurance, posture, and balance. Results suggest that individuals can improve their muscle endurance and flexibility using relatively low intensity Pilates exercises however, posture, and balance did not change significantly (Kloubec 2010).

A recent study by Fourie and his colleagues examined the effects of a mat Pilates programme on body fat in elderly women. They could concluded that an eight-week mat Pilates exercise programme may contradict or even reverse some of the most serious consequences of ageing associated with an increased fat mass and reduced lean

body mass in elderly females (Fourie et al. 2013). Dunn and his colleagues in their narrative review (Dunn et al. 2001), and Craft and Landers in their meta-analytic review (Craft and Landers, 1998), both concerning effects of exercise on psychological well-being in the general population, were not able to provide evidence of such dependence. Arent et al. reviewed 32 studies and concluded that exercise is associated with improved mood in the elderly (Arent et al. 2000). Yet Spirduso and Cronin in their qualitative review on older adults proposed that physical activity might enhance quality of life in older adults without improving cardio respiratory status. They postulated that the act of exercising might be beneficial in itself (Spirduso & Cronin 2001). Rejeski et al. (1996) found in a literature review on the connection between PA and QOL that change in life satisfaction is often unrelated to changes in objective markers of fitness (e.g., aerobic power) (Rejeski et al. 1996). QOL shows strong and direct relationship with health status. Health and functional status are two variables that are often found to explain QOL of older adults. In a review on perceived health of older adults and QOL, Moore, et al. (1993) reported that for 11 of 17 studies, there was a strong positive relationship between these two variables (Moore, et al. 1993). Raphael et al. (1997) also reported a positive relationship between QOL and health status of older adults. In a Japanese study relationship between functional fitness and life satisfaction was assessed from the perspective of quality of life by 123 older individuals ($M = 74.3 \pm 5.4$ years) The analysis revealed no overall correlation between the total fitness and total life satisfaction scores, but some of the life satisfaction factors were significantly related to some functional fitness items ($p < 0.01$). The results suggested that it was important for older people to maintain their functional fitness in order to manage a high quality of life (Chang et al. 2001). These results suggest that regular physical activity improve general health status, which contribute to maintain or even to improve quality of life in old age (Pavot 1993, Raphael et al. 1997).

Interventions aimed to develop quality of life and cognitive function besides motor skills, many times apply a so-called 'mind and body method', in which the control of the mind on each body movement has to be present at all time. Pilates and Yoga are the best examples. Oken and his colleagues conducted a 6-month trial of yoga to determine the effects on cognitive function, fatigue, mood, and quality of life in seniors. There were no effects in any of the cognitive or alertness outcome measures, but the program

showed improvement in a number of quality of life measures and in physical measures as well (Oken et al. 2006). An 8 week long Pilates study, aimed to evaluate the effects of the method on personal autonomy, static balance and quality of life (measured by WHOQOL-OLD) by 52 healthy elderly females found that the Pilates method can offer significant improvement in personal autonomy, static balance and quality of life as well (Rodrigues et al. 2010).

In the Hungarian sport scientific research the old generation is a relatively understudied age group. More importantly, there have been very few structured intervention programs focusing on how physical activity influences fitness and quality of life. A good exception is from Barthalos and his colleagues about anthropometrical, physical and QOL effects of a 15-week long program in elderly women (Barthalos et al. 2009).

In the international literature a lot of articles can be found in the topic, especially in the last fifteen-twenty years, and in these the topic is approached from many different aspects – frequently social and natural scientific approaches meet in a single study. Quality of life, anthropometric and fitness indexes are researched, which researches are often based on interventions. These publications showed us the direction - our present empirical research is planned along these works.

6. OBJECTIVES

6.1. Purpose of the study

With this gap-filling study, our main purpose was to present the effects of a six-month intervention program - modified Pilates training and Aqua fitness training on physical functioning, quality of life, attitudes to the aging process and assertiveness in a healthy, old population.

It was examined how physical performance, QOL, attitudes to ageing and assertive behaviour change due to regular training by the end of the six month program, and which of the two types of exercises – Pilates or Aqua-fitness – had stronger effects on the above mentioned variables.

We wanted to change our participants' way of life with respect to physical activity – to make PA part of their lives on the long run.

6.2. Main questions

Q.1. Do old people's physical condition, QOL, attitudes to ageing and assertiveness change significantly by the end of the six-month intervention program in the different groups?

Q.2. Which components of physical fitness - aerobic capacity, flexibility, strength, motor agility/dynamic balance – can be developed significantly by the program in the different groups?

Q.3. Which components of quality of life - autonomy, sociability, attitudes towards death, activities of past, present and future, perception and intimacy - can be developed significantly by the program at the different groups?

Q.4. Which of the three factors - psychological growth, psychosocial loss, or physical change – of attitudes to ageing can be developed significantly by the program in the different groups?

Q.5. Which components of assertiveness - insecurity, self-esteem disorders, self-assertion being a customer, saying no, personal involvement in relationships, expressing feelings - can be developed significantly by the program at the different groups?

Q.6. Does the type of exercise program have effect on the changes?

6.3. Hypothesis

H.1. We suppose that all components of physical fitness - aerobic capacity, flexibility, strength, motor agility/dynamic balance – can be developed significantly by the program in both groups.

H.2. It is supposed that autonomy and sociability will change significantly by both exercise groups as the result of the program.

H.3. Aqua aerobic will improve more areas of QOL than land exercise because of the positive effect of the different medium.

H.4. Regular exercise will lead older people to appropriate self-assessment and higher self-efficacy. The positive changes in these personal traits will help them to behave assertively in difficult situations.

H.5. It is supposed that in the change of assertive behaviour no difference is going to be measured between the two groups.

H.6. We suppose that the six month program will be long enough to change previously inactive persons' lifestyle and many of the participants will continue their participation on training sessions after the end of the program, even if they will have to pay for it.

7. MATERIALS AND METHODS

7.1. Sample

The participants were members of the three clubs for the retired in Eger. Altogether, they have 180 members. Those members, whose state of health allowed and were willing to take part, were involved (N=54). Advantages of being active in old age and disadvantages as well as risks of sedentary lifestyle were thoroughly presented for club members. They were all informed about details of the intervention program and could ask freely questions during organized meetings. All participants supplied their written consents to participate; the study was approved by the local Committee of Ethics. Those participants' results, who missed more than 20% of the classes, were not taken into account. In our opinion (and according to the above mentioned ACSM/AHA recommendations), physical activity cannot be regarded regular in those cases.

Participants mean age was 66.45 years (± 6.2) and 76.4% were women. Half of the sample had college or university degree (50%), 40.7 % had secondary and 9.3 % had elementary education. Participants were randomly assigned into three groups. The first group (N=22, M = 66.55 \pm 5.5), did basic Pilates mat workout three times per week for 60 minutes. The 77% of the participants in this group were females. The second group (N=17, M = 67.9 \pm 6.9) did Aqua-fitness three times weekly for 60 minutes. The 77% of the group were female participants. The third one was the control group (N=15, M = 64.6 \pm 6.2). Its participants were females in 74 % (Table 5).

None of the participants in our sample did regular physical activity previous the program (regular physical activity was defined as exercising in a moderate at least for 30 minutes three times per week). They had to provide certificate from their general practitioner about their health status. Their previous illnesses and regular drug intake should have been reported.

Table 5 Demographic characteristics of the sample

Groups	Participants	N	Mean age	Education level (%)			Program completed
				Elementary	Secondary	Coll./uni	
Pilates	N=54, M=66.45± 5.5; 76.4% women)	22	66.55± 5.5	9.3	40.7	50	3x60 min modified Pilates for 6 months
Aqua		17	67.9 ± 6.9				3x60 min aqua fitness for 6 months
Control		15	64.6 ± 6.2				no activity

7.2. Exercise programs: Modified Pilates and Aqua fitness

Pilates is a full body workout concentrating on the deep muscles, which are responsible for the right posture. Control of the mind during the exercises is crucial, so we attached great importance to muscle control and proper implementation in the sessions. There is a so-called 'power-house', the centre of the body. If it is strengthened, it offers a solid foundation for any movement. This power engine is a muscular network, which provides control over the body and comprises all the front, lateral and back muscles, found between the upper inner thighs and armpits. Pilates, practised appropriately and regularly, improves body consciousness very well.

Breathing also plays an important role in Pilates exercises, so at the beginning of our program it was important to teach the participants how to breathe correctly during the exercises. The sessions were performed with slow, relaxing music for maximum effect.

After warm up, a 20-minute aerobic session was included before the basic Pilates mat workouts. It consisted of low-impact, basic aerobic steps with easy arm movements to improve endurance, coordination and dynamic balance.

The basic, low-impact steps, which were implemented lineal and in combination:

- side-to-side

- step-touch
- marching
- lounge
- front kick with toe touch
- front kick with heel touch
- knee lift
- heel up
- V-step
- grapevine
- leg raises with arm raises
- etc.

Example of choreography (32 beats)

- 4x side-to-side with arms to the side (starting to the right)
- 4x heel up
- 2x double heel lift
- 2x grapevine (to the right, to the left)

Table 6 Structure of a 60-minute Modified Pilates session

Modified Pilates workout - exercises	Purpose	Duration
Breathing exercises, static and dynamic stretching exercises	Warm up	10-15 minutes
Low-impact aerobic steps & simple combinations	Aerobic endurance and dynamic balance improvement	15-20 minutes
Basic Pilates mat exercises: <ul style="list-style-type: none"> - Pilates natural spine position - Pilates Bridge - Arms over - Chest lift - One Leg Circle - The side kick series - Saw - Rolling like a ball - Pelvic curl - C Curve - Basic Cat exercise - Swan - etc. 	Strengthening, mobilization and ROM improvement	30 minutes

Because of prospective participants' age and previous illnesses some exercises had to be treated carefully – especially those, which went together with high chest pressure, burdened the lumbosacral junction and the trunk rotational exercises.

The Aqua fitness sessions were planned according to the recent recommendations of the ACSM (2009). Not only aerobic endurance and strength exercises, but also balance activities and flexibility exercises were included in the sessions.

Table 7 Structure of a 60-minute Aqua Fit session

Aqua Fit - exercises	Purpose	Duration
Breathing exercises, static and dynamic stretching exercises, jog in place-marching, etc.	Warm up	10 minutes
<ul style="list-style-type: none"> - Squat Jacks with arm press - Jog in place – pump arms at sides - leg curls - Rocking horse - Kicks – front. side, back - Pendulum - etc. 	Aerobic endurance and dynamic balance improvement	15 – 20 minutes
<ul style="list-style-type: none"> - Kicks – e.g. front kick, triceps press backwards - Front kick with toe touch - Straddle stance, rotator cuff sweep – side-to-side - Leg raises with arm raises - Shoot through – side-to-side (with noodle) - noodle push down - noodle jump - flexibility exercises by pool wall - etc. 	Strengthening, mobilization and ROM improvement	30 minutes

Intensity was gradually increased by both groups; it went from low-intensity to moderate intensity level. Pulse control was applied on every session. (Aerobe zone was calculated for all participants individually with Karvonen index.)

7.3. Assessments

Three experts were responsible for taking the measurements before and after the program, and to run the classes for six months. These experts were qualified physical education teachers and physiotherapist.

The Fullerton Functional Fitness Test was chosen to measure the changes in those physiological attributes, which support behaviours needed to perform everyday activities required for independent living: aerobic capacity, flexibility, strength, motor agility/dynamic balance. This test was especially developed for older adults through research at the lifespan Wellness Clinic at California State University, Fullerton (Rikli & Jones, 1999). It is easy to administer, safe for older participants, and require minimal equipment, time, and space. Reliability and validity of the test was examined by Miotto et al. (1999). In conclusion, they found that most of the evidence of the stability reliability and discriminate validity analyses supported the view that the Fullerton FFT battery is a reliable and valid test of functional fitness (Miotto et al. 1999).

Table 8 Test items of the FFFT

Tests	Purpose
30-Second Chair Stand	To assess lower body strength.
Arm Curl	To assess upper body strength.
6-Minute Walk Test	To assess aerobic endurance.
Chair Sit and Reach Test	To assess lower body (primarily hamstring) flexibility
Back Stratch	To assess upper body (shoulder) flexibility
8' Up and Go	To assess physical mobility – involves power, speed, agility, dynamic balance.

- Chair Stand Test – to assess lower body strength: total number of stand ups from a chair in 30 seconds.
- Arm Curl Test – to assess upper body strength: total number of arm curls with a dumbbell in the hand for 30 seconds: 1 kg dumbbell - for females - or 2 kg - for males.
- Walk Test – to assess aerobic endurance: the total number of meters walked around a measured course in 6 minutes (m).
- Back Scratch Test – to assess upper body (shoulder) flexibility: the distance between middle digits at the back (+, - cm).
- Chair Sit and Reach Test – to assess lower body (primarily hamstring) flexibility: the distance between big toe and tip of middle digits (+, - cm).
- 8-Foot Up and Go Test to assess physical mobility (speed, agility, and dynamic balance): time needed to stand up from a chair, bypass a buoy, and sit down (s).
- Body mass index (BMI, kg/m²) were assessed with Inbody-230 body composition analyzer.

Body mass index (BMI), an estimate of body composition is also included as a test item because of its relationship to disease and dysfunction (Shephard 1997).

Demographic Questionnaire

The most important demographic data (age, marital status, sex, and educational background) were asked by a simple, self-developed questionnaire (Appendix 1).

Quality of life

It was measured by **WHOQOL-OLD**, a 24-item, 6-facet test, developed from WHOQOL group to assess quality of life of older adults. The 24 questions are grouped around six main topics, which are signed by a number besides the letter „F” (F25–30). Questions signed by F25 are about perception, questions by F26 - autonomy, F27 - activities of past, present and future, questions by F28 - sociability, questions by F29 - attitudes towards death, and F30 – intimacy. A five-level interval scale is used to give the answers.

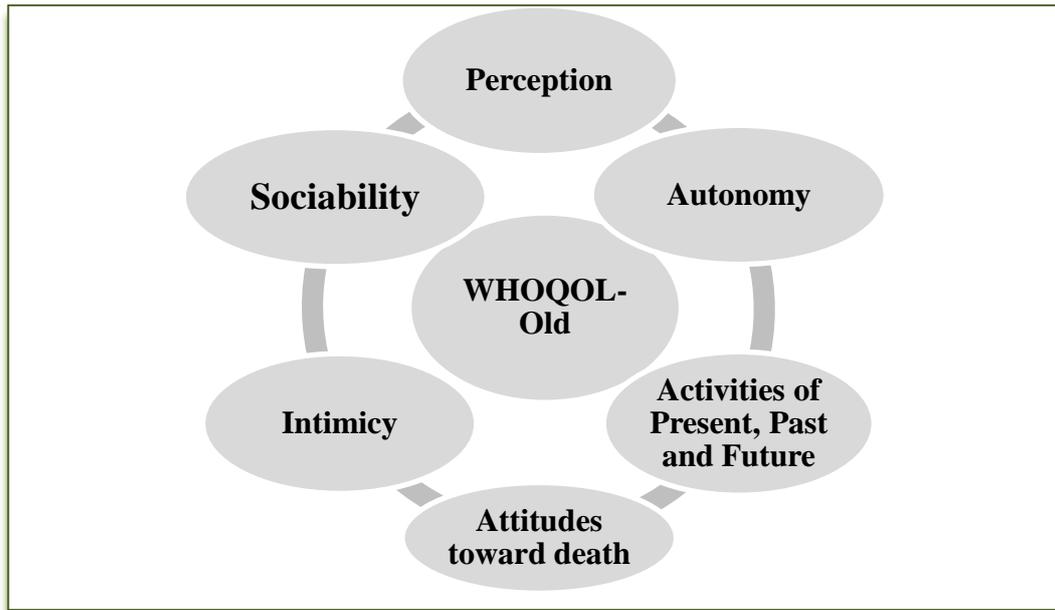


Figure 3 Structure of the WHOQOL-OLD questionnaire

The “*Sensory Abilities*” facet assesses sensory functioning and the impact of loss of sensory abilities on quality of life. The “*Autonomy*” facet refers to independence in old age and thus describes the amount of being able to live autonomously and to take own decisions. While the “*Past, Present, and Future Activities*” facet describes satisfaction about achievements in life and at things looking forward to, the “*Social Participation*” facet delineates participation in activities of daily living, especially in the community. The “*Death and Dying*” facet is related to concerns, worries, and fears about death and dying, while the “*Intimacy*” facet assesses being able to have personal and intimate relationships (WHOQOL-OLD Group 2006).

The scoring of the module can consist of a profile set of six facet scores, or, there can be a single total score „overall” based on a summation of all 24 items in the module. The psychometric properties of the WHOQOL-OLD module are based on the results of the WHOQOL-OLD Field Trial. The Field Trial analyses were conducted in a sample of N=5566 with data coming from 20 national centres. The sample size recruited in each centre varied between n = 116 (Edinburgh) and n = 455 (Umea), n = 333 (Hungarian). Cronbach’s alpha as a measure of internal consistency reached satisfactory values with an acceptable range from $\alpha = .72$ to $\alpha = .88$ for each facet score, while the total score displayed a consistency coefficient of $\alpha = .89$ (WHOQOL-OLD Group). (Appendix 2)

Attitudes to Ageing Questionnaire (AAQ)

The AAQ is developed by the same expert group as the QOL-OLD Questionnaire. It is a self-report measure with which older people themselves can express their attitudes to the process of ageing. A total of 5,566 from 20 centres worldwide participants tested the questionnaire and contributed to the development of the new scale. The result is a 24-item cross-cultural attitudes to ageing questionnaire consisting of a three-factor model encompassing psychological growth (reflecting positive gains of ageing), psychosocial loss (old age seen as a negative experience involving psychological and social loss), and physical change (focusing on physical functioning) (Laidlaw 2006) (Appendix 3).

Rathus's assertiveness questionnaire

Self-advocacy, self-efficacy, self-esteem, expression of emotions and social skills were assessed by the Rathus assertiveness questionnaire. Assertiveness well predicts how the individual is going to behave in conflict situations whether at work or in everyday life. The available test score is between -90 and +90. The higher the score is, the more assertive the individual can be characterized.

The 30-item questionnaire assesses assertive behaviour between individuals in interpersonal situations, social skills, and changes in social skills. The following five factors occur in the psychometric analysis of the test: uncertainty, self-esteem disturbance, expression of emotions, self-efficacy, saying no, and the personal involvement in relationships. The test has strong internal consistency, proper reliability and validity. The schedule is shown to have moderate to high test-retest reliability ($r=.78$; $p<.01$) (Rathus 1973). (Appendix 4).

7.4. Statistical Analysis

The questionnaires were filled in individually by participants. Data were analyzed by Statistical Package for Social Sciences for Windows, version 17.

Characteristics of the sample were described by Descriptive Statistics, Frequencies. Differences between pre-and post-measured data were analyzed by Paired Samples T-test. Repeated Measures ANOVA was used to test the effect of the type of group and

time on variables and the interaction between time and group effects. All measures were assessed for normality of distribution, and Mauchly's test was completed as the prerequisite of Repeated Measures ANOVA. Scheffe's Post Hoc test was used to discover differences between group results.

8. RESULTS

The homogeneity of the groups was analyzed by the Kruskal-Wallis Non-Parametric test, where the grouping variable was 'groups' (Aqua, Pilates and Control).

The variables examined in the study were proved to be homogeneous ($p \geq 0.05$), and suitable for higher level of statistical analysis. The minimum and maximum scores found in the Kruskal-Wallis test were: WHOQOL-OLD activities of present, past and future, Chi-Square=5.286, $df=2$, $p=.071$ (minimum); Rathus Insecurity - Chi-Square=.052; $df=2$; $p=.974$ (maximum).

8.1. Differences between the pre-test and post-test data

In the analyses of the 3 questionnaire overall results there was only significant difference between pre-end post program means in the attitude towards the aging process by the aqua group ($t = -2.88$, $p < 0.05$). Neither overall quality of life, nor assertive behaviour changed significantly in any of the groups.

Table 9 Mean values (\pm SD) of QOLsum, overall attitude and Rathussum recorded in older adults before (Pre) and after (Post) the experiment

Tests	Control (n = 15)		Pilates (n = 22)		Aqua (n = 17)	
	Pre	Post	Pre	Post	Pre	Post
QOLOUD	74.9 \pm 10.5	73.7 \pm 8.5	76.8 \pm 6.9	77.6 \pm 4.8	76.4 \pm 8.35	79.55 \pm 5.3
AAQ	3.1 \pm 0.3	3.1 \pm 0.3	3 \pm 0.3	3.1 \pm 0.25	2.97 \pm 0.3	3.15 \pm 0.21*
Rathus	11.5 \pm 5.75	10.7 \pm 5.96	14.1 \pm 11.1	13.2 \pm 13.7	7.8 \pm 17.6	10.8 \pm 15.6

Significantly different from the respective 'Pre' value: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

8.1.1. Changes in Physical Functioning

Significant differences were found in 5 of the 7 variable pairs at the Pilates group. Lower ($t = -12.239$, $p < 0.001$) and upper body strength ($t = -10.211$, $p < 0.001$), lower body flexibility ($t = 7.334$, $p < 0.001$) physical mobility ($t = 7.335$, $p < 0.001$) (dynamic

balance) and aerobic endurance ($t = -6.99$, $p < 0.001$) improved significantly as the result of the 6 month program. Shoulder flexibility and BMI did not change significantly.

For the Aqua group all these 5 items, lower ($t = -6.137$, $p < 0.001$) and upper body strength ($t = -6.784$, $p < 0.001$), lower body flexibility ($t = 7.172$, $p < 0.001$) physical mobility ($t = 4.062$, $p < 0.001$) (dynamic balance) and aerobic endurance ($t = -7.739$, $p < 0.001$), plus upper body flexibility ($t = 2.895$, $p < 0.05$) changed significantly. Only BMI did not change significantly. Lower body strength improved in the control group ($t = -3.413$, $p < 0.01$).

In this chapter where significant differences were found between the pre-and post measured data (with Paired Samples T-test), the results are shown not only with tablets, but bar charts as well for better visualisation.

Table 10 Mean values (\pm SD) of the Fullerton fitness test recorded in older adults before (Pre) and after (Post) the experiment

Physical function	Control (n = 15)		Pilates (n = 22)		Aqua (n = 17)	
	Pre	Post	Pre	Post	Pre	Post
Chair stand	19.8 \pm 4.9**	22.3 \pm 5.9*	16.2 \pm 2.9	23.6 \pm 3.3***	16.1 \pm 4.4	21.6 \pm 3***
Arm curl	28.5 \pm 5.3	27.9 \pm 3.4	23.7 \pm 4.2	32.1 \pm 4.2***	21.7 \pm 4.3	29.5 \pm 3.15***
Back stretch	7.3 \pm 8.45	8 \pm 10.4	-86 \pm 6.5	-3.4 \pm 5.6	1.3 \pm 8.4	-2.7 \pm 8*
Sit and reach	7.7 \pm 7.3	4.9 \pm 8.1	4.9 \pm 8.7	-8.3 \pm 4.6***	5 \pm 8.7	-8.3 \pm 6.8***
8 Up and go	5.4 \pm 0.6	5.65 \pm 0.8	5.9 \pm 0.8	5 \pm 0.5***	6.5 \pm 1.2	5.45 \pm 0.9 **
Six min.walk	418 \pm 71.8	416 \pm 63.2	406.5 \pm 83	537.4 \pm 54.3***	427.5 \pm 73.6	525.3 \pm 84.4***
BMI	28.9 \pm 5.1	27.7 \pm 3.9	26.4 \pm 3	25.9 \pm 3	26.9 \pm 2.3	26 \pm 2.2

Significantly different from the respective 'Pre' value: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

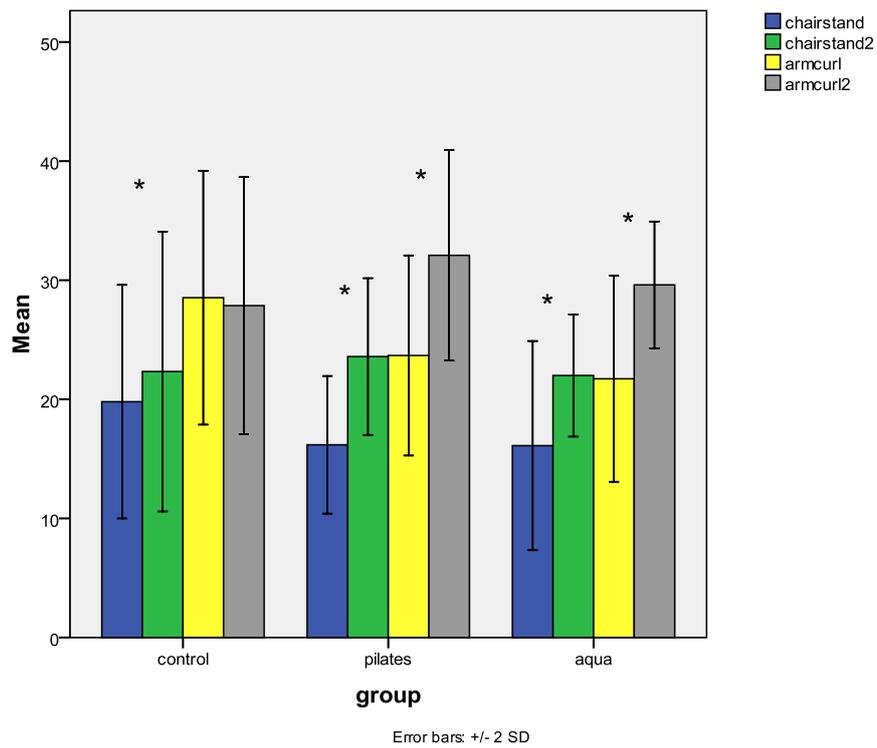


Figure 3 Pre-and post measured data by the FFFT – 1. *p≤,05

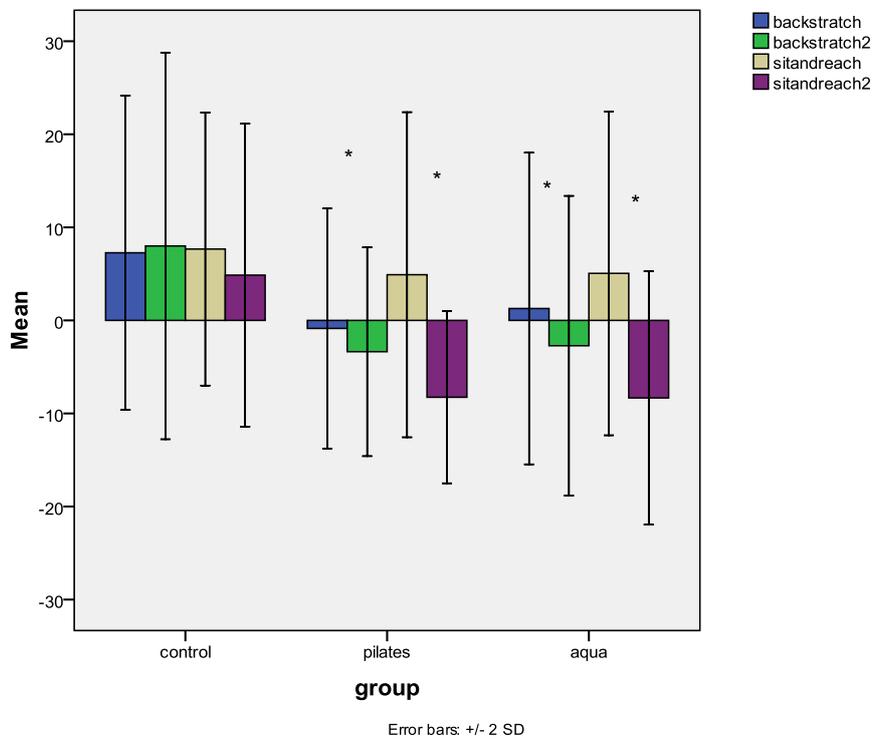


Figure 4 Pre-and post measured data by the FFFT – 2. *p≤,05

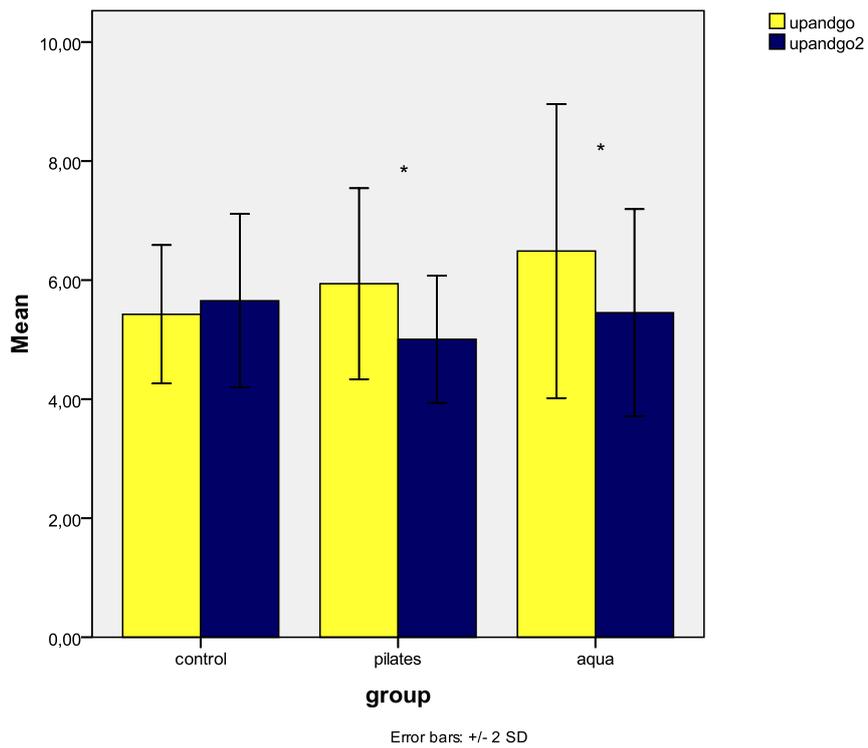


Figure 5 Pre-and post measured data by the FFTT – 3. * $p \leq 0,05$

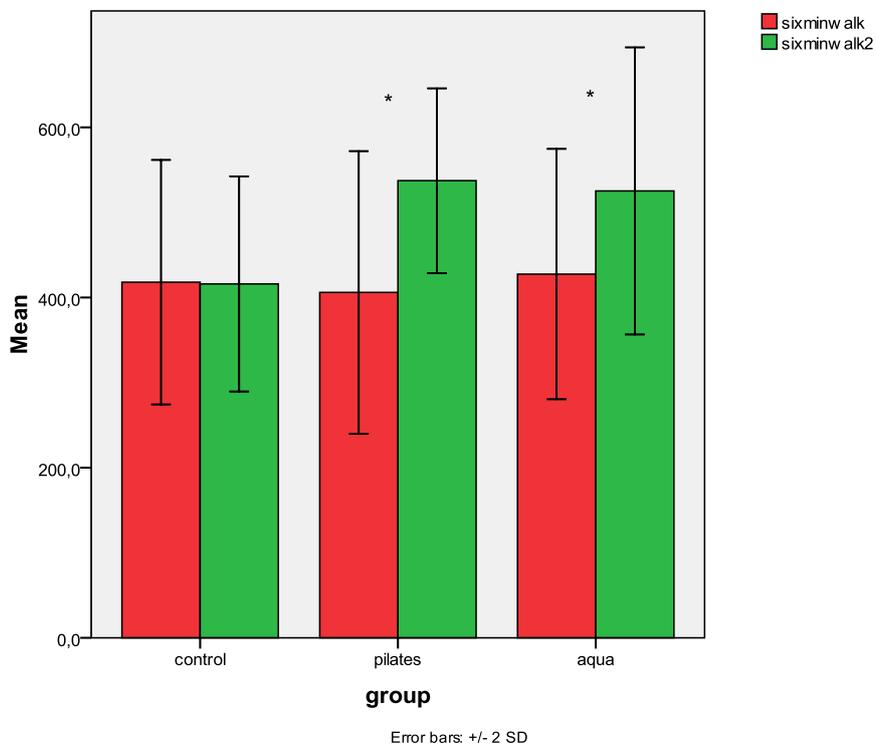


Figure 6 Pre-and post measured data by the FFTT – 3. * $p \leq 0,05$

8.1.2. Changes in quality of life

Autonomy ($t = 3.25$, $p < 0.01$) and perception ($t = -4.813$, $p < 0.001$) at the Pilates group and sociability ($t = -4.75$, $p < 0.001$) at the Aqua group, as subscales of QOL, improved significantly by the end of the program.

Table 11 Mean values (\pm SD) of the QOL-OLD questionnaire recorded in older adults before (Pre) and after (Post) the experiment.

Quality of life	Control (15)		Pilates (22)		Aqua (17)	
	Pre	Post	Pre	Post	Pre	Post
Perception	10.4 \pm 2.4	9.6 \pm 2.5	8.9 \pm 1.4	10.3 \pm 1.7***	10.1 \pm 1.3	10 \pm 1.4
Autonomy	14.3 \pm 2.5	14.5 \pm 2.7	15.55 \pm 2.5	14.3 \pm 2.2**	14.2 \pm 3.05	14.7 \pm 2.2
Present, past, future	14.2 \pm 2.2	13.9 \pm 1.9	14.2 \pm 1.8	13.7 \pm 2.2	14.2 \pm 2.8	14.8 \pm 1.8
Sociability	14.1 \pm 2.3	14 \pm 2.2	14.95 \pm 2.15	15.55 \pm 1.9	14.8 \pm 2.55	16.3 \pm 2.2***
Death	10 \pm 5.6	10.1 \pm 4.9	10.7 \pm 4.2	10.6 \pm 3.9	9.6 \pm 3.4	9.2 \pm 2.5
Intimacy	11.9 \pm 4.8	11.7 \pm 4.3	12.55 \pm 4.6	13.1 \pm 3.7	13.5 \pm 4.3	14.4 \pm 3.5

Significantly different from the respective 'Pre' value: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

8.1.3. Changes in the attitude to the aging process

Significant difference was found in the attitude to the physical changes due to the aging process in both exercising groups – Pilates ($t = -3.065$, $p < 0.001$), Aqua group ($t = -3.086$, $p < 0.001$).

Table 12 Mean values (\pm SD) of the AAQ recorded in older adults before (Pre) and after (Post) the experiment

Attitudes to ageing	Control (15)		Pilates (22)		Aqua (17)	
	Pre	Post	Pre	Post	Pre	Post
Psychological loss	2.2 \pm 0.5	2.36 \pm 0.6	2.6 \pm 0.7	2.5 \pm 0.5	2.2 \pm 0.6	2.3 \pm 0.5
Psychological growth	3.6 \pm 0.8	3.6 \pm 0.6	3.4 \pm 0.5	3.35 \pm 0.4	3.5 \pm 0.5	3.6 \pm 0.4
Physical changes	3.5 \pm 0.6	3.35 \pm 0.6	3.2 \pm 0.5	3.5 \pm 0.5**	2.2 \pm 0.5	3.6 \pm 0.5**

Significantly different from the respective 'Pre' value: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

8.1.4. Changes in assertive behaviour

No significant difference was found in the different dimensions of assertiveness between the pre-and post measurement pairs.

Table 13 Mean values (\pm SD) of the Rathus's assertiveness questionnaire recorded in older adults before (Pre) and after (Post) the experiment.

Assertive behaviour	Control (15)		Pilates (22)		Aqua (17)	
	Pre	Post	Pre	Post	Pre	Post
Insecurity, self-esteem dis.	2 \pm 4.6	1.7 \pm 6.7	3.2 \pm 7.4	1.7 \pm 6.7	5.7 \pm 5.8	3.9 \pm 5
Self-assertion being customer	-0.1 \pm 4.2	-0.53 \pm 3.5	-0.6 \pm 3.4	-1.6 \pm 2.8	-0.9 \pm 2.6	1.7 \pm 2.9
Saying no	-0.5 \pm 4.4	0.5 \pm 3.2	-1.9 \pm 2.8	-1.6 \pm 3	-0.9 \pm 3.4	-0.22 \pm 2.5
Personal inv. in relationships	1.7 \pm 2.2	1.9 \pm 2.6	2.1 \pm 4	1.9 \pm 3	2.6 \pm 3.3	2.3 \pm 3.7
Expressing feelings	0.2 \pm 3.3	-0.2 \pm 2.7	-1.45 \pm 4.3	-2.45 \pm 3.2	-1.2 \pm 3.15	-1.5 \pm 3.2

Significantly different from the respective 'Pre' value: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

8.2. Intervention effects on physical functioning, quality of life, attitudes to the aging process and assertiveness

A 2-way mixed ANOVA with repeated measures was applied to test the effects of the 3 different interventions (control, Aqua and Pilates) on FFFT, QOL, AAQ and Rathus assertiveness items in two measures (pre-and post-program - time) and their interactions. The effects were examined by subscales of the tests as well.

The dependent variables were all the 21 items of the four tests. Time factor at two levels.

Type of group - control, Aqua and Pilates - was the between-subjects factor. All the multivariate tests of significance suggested the presence of a main effect for group factor ($p < 0.001$) - the presence of an interaction effect -, as multivariate tests rejected the null at $p < .05$ ($p < 0.001$). We conclude the presence of a group*time interaction. The within-subject effects results showed a statistically significant main effect of the time factor $F(1, 52) = 58.6$ ($p < 0.001$) and a statistically significant group*time interaction effect $F(2, 52) = 16.03$ ($p < 0.001$). The between-subject analyses yielded no significant main effect of the experimental group $F(1, 52) = 1.54$.

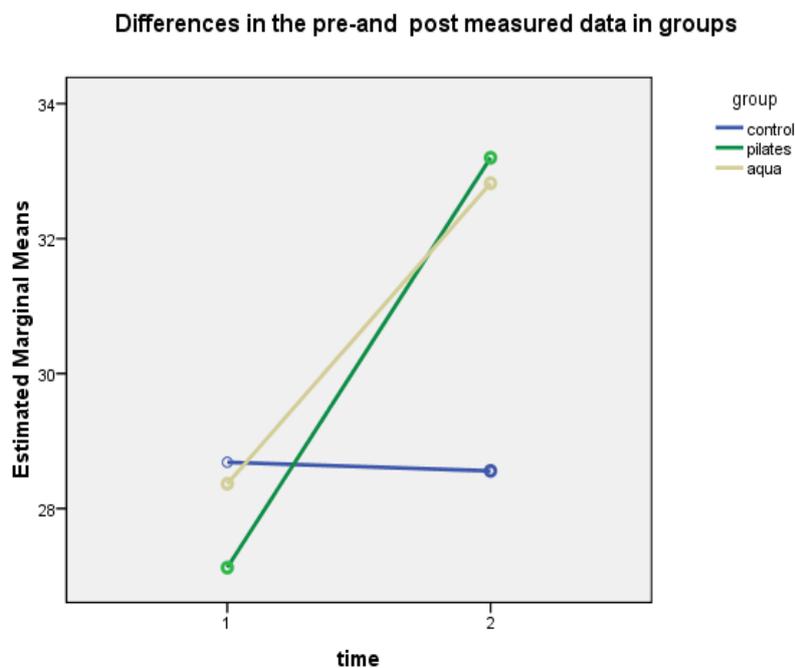


Figure 7 Profile plot – Mean changes in the four tests in the three different groups

8.2.1. Effects and group comparison on different physical functions

In **lower body strength** (chair stand) there were significant differences over time (before vs. after; $p < .001$), and a significant interaction between group and time ($p < .05$). The between-subject analyses yielded no significant main effect of the experimental group.

In **upper body strength** (arm curl) there were significant differences over time (before vs. after; $p < .001$), and a significant interaction between group and time ($p < .001$). The between-subject analyses yielded no significant main effect of the experimental group.

In **shoulder flexibility** (back stretch) there were significant differences over time (before vs. after; $p < .05$), and a significant interaction between group and time ($p < .05$). The between-subject analyses yielded a significant main effect of the experimental group ($p < 0.001$). Scheffé's post hoc analysis revealed that performance of both the Aqua and Pilates groups differed significantly from that of the control group ($p < .05$).

In **lower body flexibility** (sit and reach) there were significant differences over time (before vs. after; $p < .001$), and a significant interaction between group and time ($p < .001$). The between-subject analyses yielded a significant main effect of the experimental group ($p < 0.001$). Scheffé's post hoc analysis revealed that performance of both the Aqua and Pilates groups differed significantly from that of the control group ($p < .05$).

In **dynamic balance** (8 up and go) there were significant differences over time (before vs. after; $p < .001$), and a significant interaction between group and time ($p < .001$). The between-subject analyses yielded no significant main effect of the experimental group.

In **aerobic endurance** (6 min. walk) there were significant differences over time (before vs. after; $p < .001$), and a significant interaction between group and time ($p < .001$). The between-subject analyses yielded a significant main effect of the experimental group ($p < .05$). Scheffé's post hoc analysis revealed that performance of both the Aqua and Pilates groups differed significantly from that of the control group ($p < .05$).

In **body mass index** (BMI) there were significant differences over time (before vs. after). No interaction between group and time and no effect of the experimental group was found.

Table 14 Time, group*time effects and between group comparison of FFFT items

Physical function	F (p)		
	Time	Group*time	Between subject
Chair stand	137.15 (<.001)	9.84 (<.001)	1.52 (.295)
Arm curl	72.27 (<.001)	21.215 p(<.001)	2.34 (.106)
Back stretch	8.19 (.006)	3.87 (.027)	8.48 (.001)
Sit and reach	69.72 (<.001)	8.11 (<.001)	9.16 (<.001)
8 Up and go	30.53 (<.001)	13.5 (<.001)	2.59 (.086)
Six min.walk	69.43 (<.001)	18.47 (<.001)	4.26 (.019)
BMI	8.06 (.006)	0.37 (.716)	1.89 (.161)

8.2.2. Effects and group comparison on the different dimensions of quality of life

In **Perception** there were no significant differences over time (before vs. after), but there was a significant interaction between group and time ($p < .05$). The between-subject analyses yielded no significant main effect of the experimental group.

In **Autonomy** there were no significant differences over time (before vs. after), but there was a significant interaction between group and time ($p < .05$). The between-subject analyses yielded no significant main effect of the experimental group.

In **Activities of past, present and future** there were no differences over time (before vs. after). Neither interaction between group and time, nor effect of the experimental group was found in this dimension quality of life.

In **Sociability** there were significant differences over time (before vs. after; $p < .05$), and a significant interaction between group and time ($p = .05$). The between-subject analyses yielded a significant main effect of the experimental group ($p < .05$). Scheffé's post hoc analysis revealed that answers of the Aqua group differed significantly from that of the control group ($p < .05$).

There were no differences over time (before vs. after) in **Attitudes towards death**, and in **Intimacy**. Neither interaction between group and time, nor effect of the experimental group was found in these two dimensions of quality of life.

Table 15 Time, group*time effects and between group comparison of QOLOLD items

Quality of life	F (p)		
	Time	Group*time	Between subject
Perception	.59 (.440)	7.01 (.002)	.631 (.536)
Autonomy	.59 (.490)	8.312 (.017)	.336 (.716)
Present, past, future	.055 (.815)	1.88 (.163)	.388 (.680)
Sociability	7.03 (.011)	2.96 (.050)	2.701 (.047)
Death	.081 (.780)	.097 (.910)	.526 (.594)
Intimacy	.86 (.360)	.376 (.690)	1.35 (.268)

8.2.3. Effects and group comparison on the three factors of attitudes to ageing

There were no differences over time (before vs. after) in **Psychological loss**, and in **Psychological growth**. Neither interaction between group and time, nor effect of the experimental group was found in these two factors of attitudes to ageing.

In **Physical changes** there were significant differences over time (before vs. after; $p < .05$), and a significant interaction between group and time ($p < .05$). The between-subject analyses yielded no significant main effect of the experimental group.

Table 16 Time, group*time effects and between group comparison of AAQ items

Attitudes to ageing	F (p)		
	Time	Group*time	Between subject
Psychological loss	.930 (.339)	1.24 (.297)	1.85 (.167)
Psychological growth	.071 (.791)	.389 (.680)	1.51 (.230)
Physical changes	9.94 (.003)	6.47 (.003)	.081 (.923)

8.2.4. Effects and group comparison on the five factors of assertive behaviour

There were no differences over time (before vs. after) in any of the **5 factors of assertive behaviour**. Neither interaction between group and time, nor effects of the experimental group was found in these five factors of assertiveness.

Table 17 Time, group*time effects and between group comparison of Rathus items

Assertive behaviour	F (p)		
	Time	Group*time	Between subject
Insecurity, self-esteem dis.	1.66 (.203)	1.32 (.203)	20.24 (.280)
Self-assertion being customer	2.75 (.103)	.156 (.856)	.510 (.603)
Saying no	1.975 (.186)	.231 (.794)	1.99 (.146)
Personal inv. in relationships	.059 (.810)	0.69 (.934)	.243 (.785)
Expressing feelings	1.27 (.266)	.226 (.799)	2.18 (.131)

9. DISCUSSION

Our intervention-based study tried to fill a gap in the Hungarian sport scientific research and was conducted to show the effects of six-month regular exercise on functional fitness, needed for everyday life, quality of life, attitudes to the aging process, and assertive behaviour in a healthy, old population.

Among those studies, what we found during the literature review in the topic, many were based on intervention programs. In some studies, physical functioning, motor functions, and some psychological traits were examined together. These studies showed us the direction in development, implementation, and evaluation of our recent study. Our pre-study, conducted in Eger, about lifestyle and sport habits of people over 55, also helped us to plan our program according to the target population`s needs and interests (Vécseyné 2007).

It was found that physical functioning - in most cases - showed statistically significant improvement, but in the other aspects, like quality of life, attitudes to the ageing process, assertive behaviour, effects of regular physical activity were not always so clear. Rejeski and his colleagues, Byfield and his colleagues in their studies and Netz, et al. in their meta-analysis of intervention studies on physical activity and psychological well-being in advanced age, found similar results (Rejeski et al. 1996, Byfield 2001, Netz et al. 2005).

In our recent study the overall attitude towards the ageing process changed positively only by the Aqua fitness group. The program neither has changed overall quality of life of the participants, nor could help the elderly to stand up more for themselves – global indexes of assertiveness have not changed significantly. Rejeski et al. (1996) also found in a literature review on the connection between PA and QOL, that change in life satisfaction is often unrelated to changes in objective markers of fitness (e.g., aerobic power) (Rejeski et al. 1996). Another study, that examined the effects of two different physical activity programs on health-related quality of life, found no significant improvement in overall QOL, but did in an important quality of life outcome – bodily pain – in one of the exercising groups (Stretch & Flex group - their program consisted of stretching and flexibility exercises) (King et al. 2000).

Aqua-fitness was more effective in the improvement of shoulder flexibility than Pilates was, but no other difference could be supported in any of the motor tests between the two exercising groups. Other physical tests showed significant improvement at both exercising groups. A Pilates program, presented by Kloubec and his colleagues, demonstrated that exposure to Pilates exercise for 12 weeks, for two 60-minute sessions per week was sufficient to promote statistically significant increases in abdominal endurance, hamstring flexibility, and upper-body muscular endurance. Participants did not demonstrate improvements in either posture or balance when compared with the control group (Kloubec 2010). In our study dynamic balance improved as well, as the program was longer and sessions were more frequent.

It has to be mentioned that lower body strength changed significantly by the control group. Some control group members reported that just only taking part on the pre-measurement motivated them to start being more active (e.g., walk more). That might account for the positive change.

These results have crucial importance in the everyday lives of the old. It means that those, who live a physically active lifestyle, can perform their everyday activities individually, without the support of a family member or other kind of human support (social services, like home-nursing, etc.) This improvement has also indirect effects of the quality of lives of older individuals. It was said, that overall quality of life did not improve statistically significantly, but if we look at the results, slight positive changes can be discovered in the two exercising groups. Moreover maintaining quality of life during a half year can also be considered a result in an old population. Individual feedbacks during personal conversations with participants were also very positive. They reported a range of physical and psychological effects of the program. It made them happy to come to the sessions, meet people in their age group, share their problems, etc. Most of them were simply very grateful that we took our time and energy to deal with them.

The results also tell us that “it is never too late to start” – inactive old people can benefit much from well-designed, gradual PA programs regarding physical function.

Until nearly all markers of physical fitness improved significantly, only some aspects of quality of life were found to change as the result of the six-month program. By the analysis of the Quality of life subscales, significant improvement was found in autonomy and perception at the Pilates group and sociability at the Aqua group by the end of the program. No change was found in the control group. It means that the improvement of objective markers of physical fitness does not necessarily mean positive change in life quality, as it was found by Rejeski et. al. in a literature review on the connection between PA and QOL. Although it has to be considered, that the pre-and post measured mean values (Table 10) showed a slight positive change in both exercising groups, whereas there was a slight decline in most dimensions of quality of life in the control group. Regular exercise is a good tool to prevent decline in life quality and to maintain it for a long time. Differences between the groups were found only in the sociability facet, which delineates participation in activities of daily living, especially in the community.

Attitude towards the physical changes due to the aging process could be positively influenced by both exercising groups. They could more accept their bodies, and could look absolutely with satisfaction in the mirror from the second half of the program. We could not find significantly better values at the end of the program in BMI, but many of the participants reported that their clothes fit them much better than before and that they lost some weight (no significant difference between the pre-post measured weights).

Not any of the assertiveness components – insecurity, self-esteem disorders, self-assertion being a customer, saying no, personal involvement in relationships, expressing feelings – could be developed significantly in any of the groups by the program.

In a PhD dissertation about the connection of assertive behaviour and life – satisfaction can be read, that those older persons, who are assertive, will feel more self-worth and greater life satisfaction than unassertive older persons will. It also says that research had been done in the topic suggested that older people, who are most active, have a more positive attitude toward themselves and life, and are happier than less active older persons. These personal traits held them to express their feeling more and to behave more assertively in certain situations (Pigrem GW 1980). Further investigations are needed in the topic directly and on the indirect effect of PA on assertiveness.

As sedentary lifestyle is increasing not just among older individuals, but regarding our whole population, we regarded it a major issue to make physical activity a “need” for our participants, and to create and provide them the possibilities to continue regular exercise on the long run. Although participants have to pay for it, half of the sample still does modified Pilates training 2x a week. It means that we could make regular physical activity part of their everyday lives.

Individual feedbacks were also very positive – they loved to take part in the program and reported a range of physiological and psychological benefits.

10. CONCLUSION

It can be concluded that both Pilates and Aqua-fitness workouts three times per week, conducted regularly for a half year, are appropriate means to improve overall physical performance needed for everyday life for the inactive old and can contribute to maintain some aspects of quality of life. It helped them to accept the changes due to the aging process, but could not help them to stand up more for themselves

In our pre-study conducted in Eger about regular physical activity habits of the target population previous the intervention program, it was also revealed that female gender and higher level education had a positive effect on PA habits (Vécseyne 2007). It is worth trying to involve more males and more older adults with lower education level in the research in the future.

In program planning it is also crucial, what type of exercise is chosen, especially when the purpose of the intervention is the improvement of QOL and other psychological traits by PA. It can be read in Rejeski's review that individuals who participated in activities that they enjoyed reported the highest levels of life satisfaction (Rejeski et al. 1996). Our findings and findings of previous studies in the topic suggest that enjoyment may be a possible mediator of change in life satisfaction with involvement in physical activity (Prohaska et al. 2006, Salem et al. 2009). A more extensive program, which takes participants' needs and interests more into consideration, would be more effective on the above-mentioned global variables.

Although the number of scientific publications on the effects of regular physical activity on health outcomes has been increasing in the last twenty years, sedentary lifestyle is more and more the characteristics of the whole population, including the old generation. Our main task is to put theory in practice – promote active lifestyle by planning, implementing and evaluating intervention programs for the old, which are planned specifically according to their needs and interests.

The old generation deserve much more attention than what they get in Hungary. This study clearly proved the need for well-planned and professionally executed interventions in the future.

Tests of hypothesis

It was supposed that all components of physical fitness - aerobic capacity, flexibility, strength, motor agility/dynamic balance – could be developed significantly by the program in both groups. We experienced this expected improvement in all components, except shoulder flexibility by the Pilates group. The third hypothesis could be partly accepted.

Significant improvement was expected in autonomy and sociability in both exercising groups as the result of the program. Autonomy improved by the Pilates, sociability by the aqua group. This hypothesis was partially approved.

Aqua aerobic was expected to improve more areas of QOL than land exercise because of the positive effect of the different medium. This hypothesis has to be rejected, as only one aspect of QOL changed by the aqua group, whereas by the Pilates group two.

It was supposed that regular exercising would lead older people to appropriate self-assessment and higher self-efficacy. Improvement in these personal traits would have helped them to behave assertively in difficult situations. This hypothesis has to be rejected, as the above-mentioned personal traits did not show significant improvement due to the program.

We supposed that the six-month program would be long enough to change previously inactive persons' lifestyle and many (half) of the participants would continue their participation on training sessions after the end of the program, even if they would have to pay for it. This hypothesis was approved, while half of the participants still take part regularly (2x/week) on our modified Pilates sessions.

11. SUMMARY

Many studies prove that regular physical activity is among the most important self-care behaviours that contribute to healthy aging and can maintain quality of life through the whole lifespan (Prohaska et al, 2006; Morrow et al. 2004, Sagiv 2000). Many of these studies have been based on intervention programs in the international sport scientific literature (Byfield 2001, Oken et al. 2006, Wellmann et al. 2007, Waters & Hale 2007). With our recent study, the main purpose was to present the effects of a six-month intervention program - modified Pilates training and Aqua fitness training on physical and psychological functioning in a healthy, old population in Hungary.

A total of 54 participants ($M = 66.45 \pm 6.2$, 76.4% women) from clubs for retired people in Eger, were randomly assigned to three groups: one did Pilates 3 times/week ($N=22$, $M = 66.55 \pm 5.5$), the other did Aqua fitness 3 times/week ($N=17$, $M = 67.9 \pm 6.9$) and there was a control group ($N=15$, $M = 64.6 \pm 6.2$) Fullerton Functional Fitness Test (FFFT) was used to measure functional fitness pre-and post program. Quality of life was measured with WHO's quality of life questionnaire (WHOQOL), and changes in the attitudes towards the aging process with WHO's Attitudes to Ageing Questionnaire. Rathus's assertiveness questionnaire meant to show the changes in self-advocacy, self-efficacy, self-esteem, expression of emotions and social skills due to the program.

Motor functions, needed to perform everyday actions individually, improved significantly by both exercising groups, except shoulder flexibility by the Pilates group. Some dimensions of quality of life, perception, and autonomy in the Pilates, and sociability in the Aqua group improved significantly. There was a significant, positive change in the attitude to the physical changes in both exercising groups. The time factor had a main effect in the program, and we concluded the presence of a group*time interaction.

Our six-month intervention program was approved to be an appropriate tool for improving overall physical performance of healthy, inactive older adults, but could improve only some aspects of QOL and attitudes to the aging process. Results and experiences of this program can show the way in future program planning. There is a strong need for well-designed, professional programs for the elderly in the future.

Összefoglalás

Számos tanulmány bizonyítja, hogy a rendszeres fizikai aktivitás az egyik legfontosabb öngondoskodási magatartásforma, amely hozzájárul az egészséges öregedési folyamathoz és az életminőség fenntartásához (Prohaska et al. 2006, Morrow et al. 2004, Sagiv 2000). Ezek jelentős része intervenció programra épül a nemzetközi sporttudományos szakirodalomban (Byfield 2001, Oken et al. 2006, Wellmann et al. 2007, Waters & Hale, 2007).

Jelen tanulmányunk fő célja az volt, hogy bemutassuk egy 6 hónapos, intervenció program – módosított Pilates és aqua fitness edzés - egyes fizikai mutatókra, életminőségre, idősödési attitűdre és asszertivitásra gyakorolt hatását egy egészséges, idős populációban Magyarországon.

Vizsgálatunkban 54 fő vett részt, akik egri nyugdíjas klubok tagjaiból kerültek ki ($M = 66.45 \pm 6.2$, 76.4% nő). Véletlenszerűen három csoportra osztottuk őket – az egyik csoport módosított Pilates edzésen vett részt heti 3 alkalommal ($N=22$, $M = 66.55 \pm 5.5$), a második csoport aqua fitness edzésen heti 3 alkalommal ($N=17$, $M = 67.9 \pm 6.9$) a harmadik a kontrol csoport volt ($N=15$, $M = 64.6 \pm 6.2$). A Fullerton Functional Fitness Test-et (FFFT) használtuk a fizikai mutatókban beállt változások mérésére. Az életminőséget az Egészségügyi Világszervezet Életminőség Szakbizottsága által, időseknek kifejlesztett kérdőívével, a WHOQOL-OLD – val mértük. Az idősödési folyamathoz való hozzáállásban történt változásokat szintén a WHO kérdőívével, az Attitudes to Ageing Questionnaire – rel vizsgáltuk. A Rathus asszertivitas kérdőív célja volt, hogy bemutassa az önértékelési készség - ezzel kapcsolatban az énképben, önértékelésben, a szociális interakciókban való részvételben beállt esetleges változásokat.

A Fullerton teszt minden alszálájában jelentős javulást tapasztaltunk mindkét tornacsoportnál, kivéve a vállízületi lazaságot a Pilates csoportnál. Az életminőség összességében nem, de az egyes alszáláiban jelentős pozitív változás állt be. Az idősödési folyamatokból adódó fizikai változásokhoz mindkét csoport tagjai pozitívabban álltak hozzá a program hatására. Az ismételt mérés ANOVA az időtényező fő hatását, illetve az idő és a csoport interakciójának jelenlétét mutatta a programban.

Bebizonyosodott, hogy jelen hat hónapos programunk megfelelő eszköz volt a fizikai funkciók jelentős javítására az egészséges, idős populációnknál. A mért pszichés változóknál inkább a szinten tartásban, mintsem a fejlesztésükben van nagyobb szerepe a rendszeres fizikai aktivitásnak. Programunk eredményei és tapasztalati irányadók lehetnek a jövőbeli programtervezéshez, hiszen nagy szükség van jól tervezett és professzionálisan kivitelezett intervenció programokra a magyar idős lakosság számára.

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Appendix

Written Consent Form

You are invited to participate in a research study conducted by Magdolna Vécseyné Kovách and her research peers in the framework of her doctoral studies to find out *the effects of regular physical activity in a 6 month intervention program* designed for older adults.

Your participation is voluntary.

The program will last for a half year and you will randomly be assigned to three groups (two exercising and one control)

The following questionnaires and fitness tests will be completed pre-and post program:

- Fullerton Functional Fitness Test:
 - 30-Second Chair Stand
 - Arm Curl
 - 6-Minute Walk Test
 - Chair Sit and Reach Test
 - Back Stratch
 - 8' Up and Go
- Demographic Questionnaire
- Quality of life - WHOQOL-OLD
- Attitudes to Ageing Questionnaire (AAQ)
- Rathus's assertiveness questionnaire

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission

If you have any questions about the study, please feel free to contact:

Magdolna Vécseyné Kovách
06302079428
kovachm@ektf.hu

Your signature indicates that you have read and understand the information provided above and that you willingly agree to participate.

Eger,

Signature

Demographic Data – Questionnaire

Please provide your age in years:

1) Age:

Please circle the right answer!

- 2) Sex: **a. male** **b. female**
- 3) Education: **a. elementary** **b. secondary** **c. college/university**
- 4) Marital status: **a. living alone** **b. living with a partner**
- 5) Present illnesses: **a. no** **b. cardiovascular**
- c. osteoporosis** **d. b and c together** **e. other**

Thank you for your cooperation!

WHOQOL-OLD

WHOQOL-OLD

Instructions

This questionnaire asks for your thoughts and feelings about certain aspects of your quality of life and addresses issues that may be important to you as an older member of society. Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response. Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last two weeks. For example, thinking about the last two weeks, a question might ask:

How much do you worry about what the future might hold?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

You should circle the number that best fits how much you have worried about the future over the last two weeks. So you would circle the number 4 if you worried about your future “Very much”, or circle number 1 if you have worried “Not at all” about your future. Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.

Thank you for your help

The following questions ask about how much you have experienced certain things in the last two weeks, for example, freedom of choice and feelings of control in your life. If you have experienced these things an extreme amount circle the number next to “An extreme amount”. If you have not experienced these things at all, circle the number next to “Not at all”. You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between “Not at all” and “Extremely”. Questions refer to the last two weeks.

1. (F25.1) To what extent do impairments to your senses (e.g. hearing, vision, taste, smell, touch) affect your daily life?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

2. (F25.3) To what extent does loss of for example, hearing, vision, taste, smell or touch affect your ability to participate in activities?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

3. (F26.1) How much freedom do you have to make your own decisions?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

4. (F26.2) To what extent do you feel in control of your future?

Not at all	Slightly	Moderately	Very much	Extremely
1	2	3	4	5

5. (F26.4) How much do you feel that the people around you are respectful of your freedom?

Not at all	Slightly	Moderately	Very much	Extremely
1	2	3	4	5

6. (F29.2) How concerned are you about the way in which you will die?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

7. (F29.3) How much are you afraid of not being able to control your death?

Not at all	Slightly	Moderately	Very much	Extremely
1	2	3	4	5

8. (F29.4) How scared are you of dying?

Not at all	Slightly	Moderately	Very much	Extremely
1	2	3	4	5

9. (F29.5) How much do you fear being in pain before you die?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last two weeks, for example getting out as much as you would like to. If you have been able to do these things completely, circle the number next to “Completely”. If you have not been able to do these things at all, circle the number next to “Not at all”. You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between “Not at all” and “Completely”. Questions refer to the last two weeks.

10. (F25.4) To what extent do problems with your sensory functioning (e.g. hearing, vision, taste, smell, touch) affect your ability to interact with others?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

11. (F26.3) To what extent are you able to do the things you’d like to do?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

12. (F27.3) To what extent are you satisfied with your opportunities to continue achieving in life?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

13. (F27.4) How much do you feel that you have received the recognition you deserve in life?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

14. (F28.4) To what extent do you feel that you have enough to do each day?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

The following questions ask you to say how satisfied, happy or good you have felt about various aspects of your life over the last two weeks . For example, about your participation in community life or your achievements in life. Decide how satisfied or dissatisfied you are with each aspect of your life and circle the number that best fits how you feel about this. Questions refer to the last two weeks.

15. (F27.5) How satisfied are you with what you have achieved in life?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Completely
1	2	3	4	5

16. (F28.1) How satisfied are you with the way you use your time?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Completely
1	2	3	4	5

17. (F28.2) How satisfied are you with your level of activity?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Completely
1	2	3	4	5

18. (F28.7) How satisfied are you with your opportunity to participate in community activities?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Completely
1	2	3	4	5

19. (F27.1) How happy are you with the things you are able to look forward to?

Very unhappy	Unhappy	Neither happy nor unhappy	Happy	Very happy
1	2	3	4	5

20. (F25.2) How would you rate your sensory functioning (e.g. hearing, vision, taste, smell, touch)?

Very poor	Poor	Neither poor nor good	Good	Very good
1	2	3	4	5

The following questions refer to any intimate relationships that you may have. Please consider these questions with reference to a close partner or other close person with whom you can share intimacy more than with any other person in your life.

21. (F30.2) To what extent do you feel a sense of companionship in your life?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

22. (F30.3) To what extent do you experience love in your life?

Not at all	A little	A moderate amount	Very much	An extreme amount
1	2	3	4	5

23. (F30.4) To what extent do you have opportunities to love?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

24. (F30.7) To what extent do you have opportunities to be loved?

Not at all	A little	Moderately	Mostly	Completely
1	2	3	4	5

Do you have any comments about the questionnaire?

THANK YOU FOR YOUR HELP

Appendix 4

WHOQOL-OLD Attitudes toward Ageing

Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
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Scale	1	2	3	4	5
1. Want to give a good sample					
2. Believe my life has made a difference					
3. Pass on benefits of experience					
4. Important to take exercise at any age					
5. Wisdom comes with age					
6. Growing older easier than I thought					
7. Loss physical independence as I get older					
8. Privilege to grow old					
9. My identity is not defined by my age					
10. Pleasant things as I growing older					
11. Better able to coping life					
12. More accepting of myself					
13. More difficult to make new friends					
14. I do not feel old					
15. More difficult to talk about feelings					
16. Old age depressing time of life					
17. Physical health problems don't hold me back					
18. More energy than I expected for my age					
19. Don't feel involved in society					
20. Health is better than expected for my age					
21. Keep myself fit and active by exercising					
22. Old age is a time of loneliness					
23. I feel excluded because of my age					
24. Old age mainly as a time of loss					

The Simple Rathus Assertiveness Schedule

Directions: Indicate how well each item describes you by using these codes:

3 - very much like me

2 - rather like me

1 - slightly like me

-1 - slightly unlike me

-2 - rather unlike me

-3 - very much unlike me

1.	Most people seem to be more aggressive and assertive than I am.	
2.	I have hesitated to make or accept dates because of "shyness."	
3.	When the food served at a restaurant is not done to my satisfaction, I complain about it to the waiter or waitress.	
4.	I am careful to avoid hurting other people's feelings, even when I feel that I have been injured.	
5.	If a salesperson has gone to considerable trouble to show me merchandise that is not quite suitable, I have a difficult time saying "No."	
6.	When I am asked to do something, I insist upon knowing why.	
7.	There are times when I look for a good, vigorous argument.	
8.	I strive to get ahead as well as most people in my position.	

9.	To be honest, people often take advantage of me.	
10.	I enjoy starting conversations with new acquaintances and strangers.	
11.	I often don't know what to say to people I find attractive.	
12.	I will hesitate to make phone calls to business establishments and institutions.	
13.	I would rather apply for a job or for admission to a college by writing letters than by going through with personal interviews.	
14.	I find it embarrassing to return merchandise.	
15.	I have avoided asking questions for fear of sounding stupid.	
16.	If a close and respected relative were annoying me, I would smother my feelings rather than express my annoyance.	
17.	During an argument, I am sometimes afraid that I will get so upset that I will shake all over.	
18.	If a famed and respected lecturer makes a comment which I think is incorrect, I will have the audience hear my point of view as well.	
19.	I avoid arguing over prices with clerks and salespeople.	
20.	When I have done something important or worthwhile, I manage to let others know about it.	
21.	I am open and frank about my feelings.	
22.	If someone has been spreading false and bad stories about me, I see him or her as soon as possible and "have a talk" about it.	
23.	I often have a hard time saying "No."	

24.	I tend to bottle up my emotions rather than make a scene.	
25.	I complain about poor service in a restaurant and elsewhere.	
26.	When I am given a compliment, I sometimes just don't know what to say.	
27.	If a couple near me in a theater or at a lecture were conversing rather loudly, I would ask them to be quiet or to take their conversation elsewhere.	
28.	Anyone attempting to push ahead of me in a line is in for a good battle.	
29.	I am quick to express an opinion.	
30.	There are times when I just can't say anything.	