STUDY ON SOME ASPECTS OF AGEING PROCESS LATE IN LIFE

ELENA SABĂU[1], CECILIA GEVAT[2], GEORGETA NICULESCU[1,] GEVAT NEJDET[3]
Faculty of Physical Education and Sport*Spiru Haret* University, Bucharest, ROMANIA
Faculty of Physical Education and Sport, *Ovidius* University, Constanta, ROMANIA
Faculty of Physical Education and Sport, *Spiru Haret* University, Bucharest, ROMANIA
Regina Maria, College, Constanta, ROMANIA
elenasabau20@yahoo.com

Abstract

People's ageing becomes a gradual and differential degrading process, varying from one person to the other, but never being stopped. Individuals get old differently as the origins of degrading process are both endogenous and exogenous. Ageing is observable and measurable too.

Therefore, the target of this study has been to determinate the degree of the senior citizens' normal functionality free of evident or serious diseases. The basic hypothesis tried to find differences or similarities between the ageing process of both genders.

As subjects of this study there were 130 persons (men and women), 65-70 years old, corresponding to the first stage of involution, it means the adaptation period or the passing stage to the old age.

As research methods have been used: specialized literature, ascertaining study, statistical-mathematical analysis, signification of the difference between non-correlating groups, at a probability threshold p=0.05% and graphic representation.

The researching approach incorporated six (6) tests, as follows: skin elasticity, test of rule, static equilibrium, Storm test, test of apnea and thoracic elasticity. Have been carried out comparisons between the results of both groups (men and women), pointing out the manner in which there are similarities or differences between the two genders as concerns the ageing degree.

Key words: senior citizens, ageing, test, physiological degradation.

Introduction

As bio-psycho-social human being, a person passes through three main stages during its evolution:
1st age (up to 20-24 years old), 2nd age (up to 65 year old) and old age (from 65 years until death).

Old Age represents the involution stage of the human being, during which the fundamental activity becomes "the adaptation to a new schedule of social and family activities" (T. Avramescu, and collaborators, 2007). Following the retirement from the job, seniors face with other types of relationships and activities.

The main social issues highlighted at old age cover: social protection, the trend of increase of the longevity and prophylaxis of old age, the fight against degeneration, but also the improvement of professional and social experience.

The old age, of the involution, develops on stages:
-The first stage - the adaptation period or the transition stage towards the old age (65-75 years old), the delicate biological period, with current diseases. The end of the professional activity causes some changes in lifestyle and area of concerns of old people. The body's ageing and fatigue significantly affect the activity of old people, that identify at this stage, mainly with the socio-civic activities than with professional ones.

Age and degeneration diseases induce a feeling of social inexpedience and abandonment, particularly in the situation in which their children, that became adults, are concerned with their family responsibilities and obligations, and do not have enough time for their elderly parents.

-The second stage. The average stage - between 75-85 years old - is the period of retrogressive diseases.
-The third stage. Represents the stage of the old age or of longevity, of the persons over 85 years old.
-The terminal stage, that differentiates in biological death (related to physiological and medical processes), psychological death (related to the dissolution of the behaviour and relationships with others) and social death. In the case of physiological ageing, the body uses the compensation reserve and resorts to finding its equilibrium.

Old people that do not suffer from obvious diseases, the normal functionality (senescence) is variable, in the following order: normal senescence (the ageing process accompanied by non-pathological decreases of the physiological functions) and successful senescence (the physiological decline is minimal).

Gradually, the body's ability to adapt to new environmental variations decreases, the instincts' energy and efficiency of adaptation decreases because of the trophic, biochemical, consistency and functional changes, of the body's biological structures.

Involution processes, that manifest differently at the level of the organs and tissues, are characteristic to ageing, affecting the entire body (E. Cristea, 1990). Significant biological changes observed during ageing refer to:
- Change of the corporal structure and osteoarticular system. The active mass (muscles) is reduced, in parallel with the increase of the adipose tissue, determined by the inhibition process, as well as other determinant factors, such as the sedentary lifestyle,

improper diet.

The muscles are affected by retrogressive processes, which reduce trophicity and muscle elasticity. There also occurs osteoarticular ageing by the diminution of bones. Inflammatory or retrogressive lesions in the joints are causing rheumatic affections, that appear, at old people, under the form of rheumatoid arthritis, spondylitis or arthrosis. Knees joints, coxofemural and spine are affected.

In the case of ageing affections, spine mobility is partially or totally reduced, and dysfunctions of the muscular-ligament apparatus can cause damage to the inter-vertebral disks.

- Changes of the cardiovascular and respiratory system. Age and prolonged hemodynamic stress induces characteristic changes of the heart and circulatory system. The normal values of blood pressure at old people is 160mmHg (systolic blood pressure) and 90 mmHg (diastolic blood pressure). Sclerosis, that is a characteristic disease for old age, installs at the level of arteries, but affects the function of all organs. Sclerosis at the heart and brain level induces serious consequences, often irreversible. Respiratory function decreases with age and lung elasticity is reduced resulting in the increase of residual volume. Light physical activities are recommended to old people, with the purpose of activation of the cardiovascular system.

- The affection of the renal function. Kidneys change, by the reduction of the renal mass, of the total number of glomeruli and increase of the glomeruli-sclerosis. Also, low thirst determines the increase of the dehydration risk.

- Changes in the endocrine-metabolic system. Glucose tolerance diminishes, mainly due to the insulin resistance of the peripheral tissue.

- Reduction of the immune system activity. Reduction of immune function can lead to installation of infectious diseases and cancer.

During old age depressive moods often appear, which are caused by pathological, psychological, sentimental, social factors etc..

Feelings of loneliness, combined with organic suffering, make old people anxious, irritable or, on the contrary, sad and quiet.

According to studies, ageing may vary according to personal attitudes and skills that must be exploited.

Lifestyle can affect or favour the health of old people, by creating optimal conditions for functionality or speed of the already existing dysfunctions.

Diet, sedentary lifestyle, alcohol, all these increase the installation speed of the ageing phenomena. The diet excelling in refined foods and physical inactivity, strengthens the ageing process.

Old age is often confused with a poor health. Generally, people aged between 65 and 79 years old, are double affected by diseases. Romanians aged over 65 have at least one health problem.

In a percentage of 95%, Romanian old people are living with their families, in their households, as, even if needing support, in Romania, the care and protection system is precarious.

In civilized countries a relatively small percentage of people belonging to the age group between 64-75 years old are living in hostels or asylums.

According to Mavritsakis, N., and Ghidrai, O., in the study made in 2009, on the institutionalized subjects, there is a correlation, in inverse proportion, between physical activity and depression: at higher values of the score in the geriatric depression scale, there correspond low values of the index of physical activity, and at low values of the score in the geriatric depression scale, there correspond high values of the physical activity index.

Controlled motion, with the proper interaction of the legs and hands, constitute a means of adaptation to effort and prevention of falls, at healthy old people or at those suffering of locomotor problems (G. Chiriti, D.M. Dimulescu, 2009).

Physical activity at old people, generates on the neuronal way, an increased cortical tone, a positive mood with anti depressive effects.

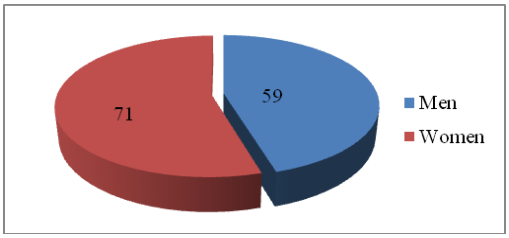
Aims and hypothesis

The target of this study - to determinate the degree of the senior citizens' normal functionality (free of evident or serious diseases).

The basic hypothesis tried to find differences or similarities between the ageing process of both genders.

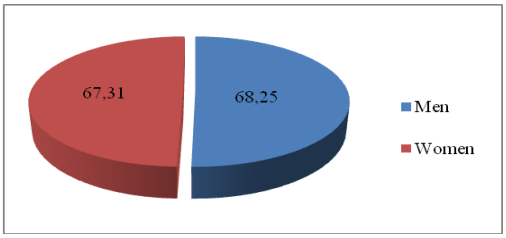
Subjects

The subjets were volunteers, healthy people for their age, without any serious healthy problems. 130 in number persons, 65 - 70 years old (Graph A).



Graph A The number of the subjetcs

Men 59 with a mean age of 68.25±1.45 years and women 71 with a mean of 67.31±1.37 years old, (Graph B) corresponding to the first stage of involution, it means the adaptation period (or the passing stage to the old age).



Graph B The age of the subjects (means)

Methods

As research methods have been used: specialized

literature, ascertaining study, statistical-mathematical analysis, signification of the difference between non-correlating groups, at a probability threshold p=0.05% and graphic representation.

The researching approach incorporated six (6) tests, as follows: skin elasticity, test of rule, static equilibrium, Storm test, test of apnea and thoracic elasticity. Have been carried out comparisons between the results of both groups (men and women), pointing out the manner in which there are similarities or differences between the two genders as concerns the ageing degree.

Results

1. Elasticity of skin

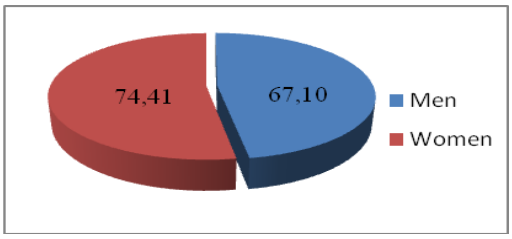
Skin changes are the most visible signs of ageing. With age, skin becomes thinner and loses its firm texture and elasticity. The external layer of skin, the epidermis becomes thiner, the number of cells containing pigment decreases and the remaining ones are increasing in size. The skin appears thus thinner and pale. Large pigmented spots appear in areas exposed to sunlight.

Changes in the connective tissue reduce skin elasticity (A. Popescu, 2009).

Test: The skin on the back of the hand, was seize for 5 seconds, between the thumb and the forefinger, then kept the necessary time until the complete disappearance of the fold.

At the first stage of the old age, the skin fold vanished on an average of 67.10 seconds for men, and 74.41 seconds for women (Graph 1).

We found no meaningful difference between men and women t<tcrt (1.56<1.98).



Graph 1 Elasticity of skin (seconds)

2. Ruler test

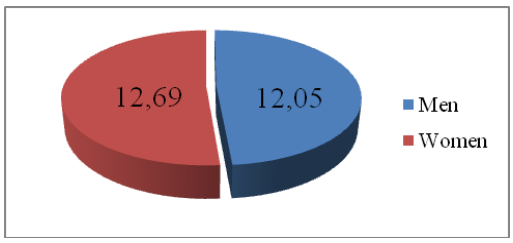
Although genetically conditioned, the ageing process has a rhythm that depends on the lifestyle and mostly of the old people's activism.

Studies sustain that fact that physical effort measured properly may be a means of prevention and treatment of structural and functional deterioration of the locomotory apparatus , with positive effects in the functionality of other apparatuses and systems. Premature ageing intervenes when movement lacks and because of the interruption of any physical and mental activities, at the retirement stage.

According to I. Dragan, (2002), the reduction of the physical potential is of 10% per decade, beginning with the age of 30 years old: 5% reduction is caused by the biological evolution, 5% due to being sedentary. The muscle mass decreases progressively, from 30% of the body weight at young people, 15% at 75 years old, because of the decrease of the number and size of muscle fibres, a process accompanied by muscle weakness and reduction of passive, active or mixed movements (N. Maveitsakis and collaborators, 2008).

Physical effort gradually doses as intensity and duration, depending on the maximal cardiac frequency (L. Pop and collaborators, 2001).

Test: A 50-centimetre ruler is held from the upper side, by another person, at the level of the scale mark 0. Index finger and thumb of your right hand (skilled hand) is placed at a distance of 8-10 centimetres, from one side and the other of the ruler, at the level of the scale mark 50. When the person lets the ruler drop, without warning the subject, he/she must catch it as soon as possible. The score is given by the scale mark at the level of which is succeed in withholding it. Perform the test three times and calculate the average performance in centimetres.



Graph 2 The ruler test (cm)

At the first stage of the old age men and women had the same performances in ruler test. The men got the ruler on an average of 12.05 cm and the women on an average of 12.69 cm. (Graph 2).

We found no meaningful difference, between gender t<tcrt (1.12<1.98).

3. Thorax elasticity

According to T. Bocu and S. Tache, (2005), the change from the active social status to the retirement involves: progressive decrease of effort capacity, the interruption of the occupational physical effort and the tendency towards becoming sedentary, with the apparition of the de-conditioning syndrome of old people.

After 60 years old, at the level of the respiratory system, some non-pathological changes occur, such as:

- Increase of the respiratory frequency when resting (from 14-15/minute to 18-19/minute) with the prolongation of expiration.
- Lung emphysema with increase of the anterior-posterior diameter and decrease the difference in the thorax diameter inspiration-expiration.
- Changes in the thorax - scoliosis, enlargement of the epigastric angle, etc., with modifications of the obstructive respiratory dysfunction type (decrease of the maximum respiratory volume per second) to the functional respiratory tests.
- The vital capacity decreases with age, along with the decrease of the volume of air current and of the alternate one, once with the increase of the residual

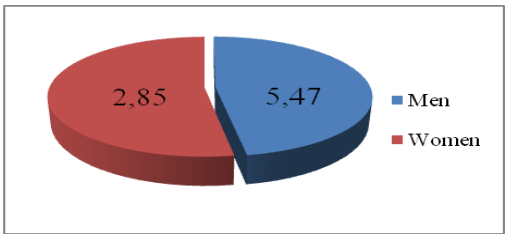
volume. At 60 years old, the vital capacity decreases by 25% as compared to 20 to 30 years old.

Once with the ageing, the thorax dynamics, the respiratory function and gas exchange decrease, mainly due to: the calcification of the thoracic wall, the sclerosis of inter-vertebral discs, the reduction of the mass and thoracic muscle strength and decrease of the lung elasticity (elastin decreases, the fibrous tissue increases).

Ventilation possibilities are reduced by 50%, but in combination with the reduction of the maximum cardiac output, the aerobic possibilities diminish. Old people are able to maintain an adequate gas exchange in the position of rest, but also during daily activities, but a sustained effort must be performed during the intense physical exercises (Beers, 2005 quoted by E.G. Butnariu, and collaborators, 2009).

Test: Thorax elasticity is measured: the thorax perimeter in maximum inspiration, then the thorax perimeter in complete expiration. After that is calcutate the difference.

At the first stage of the old age the men had an average for thorax elasticity of 5.47cm and the women about 2.85 cm.



Graph 3 Thorax elasticity (cm)

We found meaningful difference between gender, men advantage t>tcrt (3.22>1.98).

4. Test of balance

Balance control is a complex phenomenon associated with several human functions. Functions of neuromuscular system are known to decrease with ageing, particulary after the sixth decade. Degeneration of the neuromuscular system is one of the main reasons for impared balance control durig ageing and therefore it increase the number of falls in elderly people (P. Piirainen, 2010).

Balance is usually measured using static balance tests or different kinds of dynamic tests. It has been demonstrated that static balance tests do not reveal balance disorders age-related differences as dynamic balance measurements.

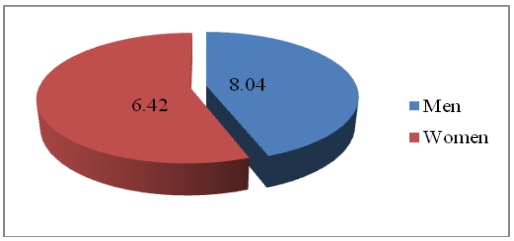
A study made at the University of Illinois suggests the improvement of the health state of old people who practice martial arts, in which simple physical and graceful exercises combine with meditation.

People having resorted to this kind of physical activity, three times a week for six months, felt the positive effects after only two months. In addition to the improvement of the equilibrium and strength, participants stated having improved also their mental and emotional state. Subjects had significant improvement of the balance capacity with the eyes open, after two months and little progress with the eyes closed after six months

Test: Standing barefoot, the heels close. Lift one leg to about 15 centimetres from the ground, the knee bent at 45 degrees. Try to keep the balance. The test is performed with the eyes closed (using the preferred leg). Performance is represented by the period in which you succeed in maintaining the balance. Perform the test three times and measure the performance by the average time obtained. We've proposed the test also with the eyes open.

At the first stage of the old age for the eyes open test the men succeded to remain still in balance about 8.04 seconds (mean) and the women about 6.42 seconds (Graph 4.1.).

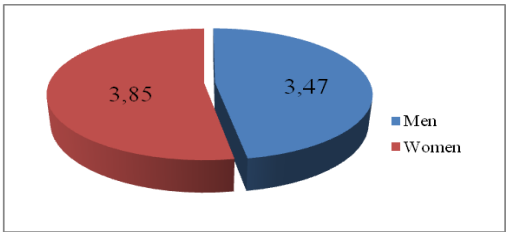
We found meaningful difference between gender, men advantage for the eyes open: t>tcrt (3.54>1.98).



Graph 4.1. Test of balance - open eyes (s)

At the first stage of the old age for the eyes closed test the men succeded to stay still in balance about 3.47 seconds (mean) and the women about 3.85 seconds (Graph 4.2.).

We found no meaningful difference between gender, men advantage for the eyes closed: t>tcrt (1.15>1.98).



Graph 4.2. Test of balance – eyes closed (s)

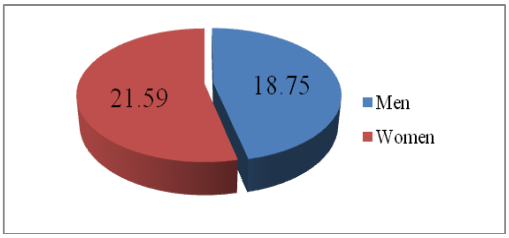
5. The apnoea test

Test: The subject is asked, that after a maximum inspiration, respectively a maximum expiration to perform a voluntary apnoea as long as possible.

The time of withholding the apnoea is being calculated.

The men performed about 18.75 seconds a maximum inspiration and the women about 21.59 second (Graph 5.1.).

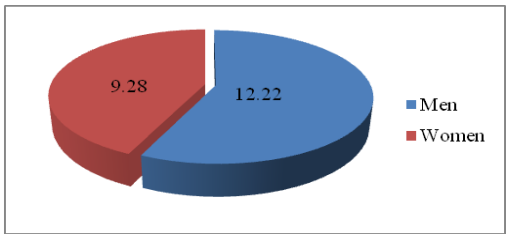
At the first stage of the old age we find meaningful difference between men and women for the test in maximum inspiration, in avantage for women t>tcrt (2.47>1.98).



Graph 5.1. The apnoea test – maximum inspiration (s)

The men performed about 12.22 seconds in average for apnoea in maximum expiration and the women about 9.28 seconds (Graph 5.2.)

At the first stage of the old age we found meaningful difference between men and women for apnoea test in maximum expiration, in avantage for men t>tcrt (3.45>1.98).



Graph 5.2. The apnoea test – maximum expiration (s)

6. The Storm test (persons over 60 years old):

The involution process of ageing induces morphological changes that are normal for the heart. Dimensions remain almost normal, the geometry of the left ventricle changes, the pericardium becomes rigid, the diameter of mitochondria increases at people over 80 years old.

The maximum cardiac frequency is reduced with the age, especially at sedentary people (I. Dragan, 2002). Blood vessels suffer changes, induced by the qualitative and quantitative altering of the elastic tissue, muscle degeneration and calcification.

Number of capillaries in tissues is reduced.

At old people, adaptation to effort and recovery are more difficult and take place slower.

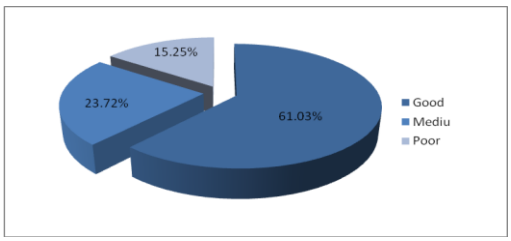
Acute physical effort causes, at old people, biological and hemodynamic changes, with repercussions on the cardiovascular adaptation (S. Tache, and C. Sirbu, 2001).

Test: The subject raises and sits on the chair 15 times.

The pulse is determined before the exercise (the pulse at rest - Pr) and immediately after the effort for 3 minutes.

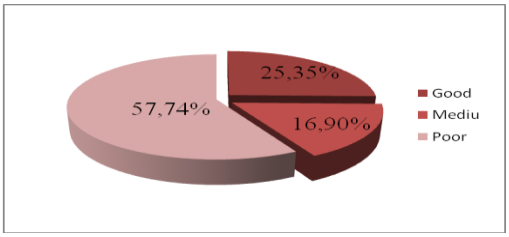
- P1 - If the increase is less than 15 and if the return to the frequency of relaxation is made in 1-2 minutes, then the adaptation to effort is good.
- P2 - If the increase is between 16 and 20, and if the return to the frequency of relaxation is made in 1-2 minutes, then the adaptation to effort is average.
- P3 - If the increase is higher than 20 and if the return to the normal frequency takes more than 2 minutes, then the adaptation to effort is bad.

Speaking about cardiac adaptation for men, we can say that about 25.35 % of them had a good answer to the test, 16.90% a medium answer, and the majority had an poor answer (Graph 6.1.). That means unassuming adaptation of cardiac function, for men in the stage of old age.



Graph 6.1. The Storm test – for men (%)

The women had the about the same answer to the simple cardiac effort. The Storme test relived that the majority of women had a poor answer to the test, about 57.74% of them. A percentage of 25.35% was for the women with medium answer and 16.90% of them had a poor answer. For our grup of subjects, at the age of 65-70 years old, the cardiac adaptation had no meaningful difference between men and women.



Graph 6.2. The Storm test – for women (%)

Conclusions

1. The presented investigation indicates that at the first stage of age of old age, about 65-70 years old, get old in the same time.

2. At 65-70 years old there are some similitudes and differences of biological and motor nature of men and women.

3. For some aspects the men anwered better, that means that maybe the women get older faster than men.

4. At this age as women and men get old rough in the same terms of skin elasticity, motric reaction, balance (with eyes closed) and adaptation to effort (adapting dominantly low).

5. There is a differences in favor of women during the apnoea in inspiration (phase) of breathing.

6. There are some difference shown in favor of men, at thorax elasticity, during apnoea in expiration, at balance with open eyes.

Bibliography

AVRAMESCU, E., T., şi colaboratorii, 2007, *Kinetoterapia în patologia geriatrică*. Craiova: Editura Universitaria, 5-11

BOCU, T., TACHE, S., 2005, Îmbătrânirea şi efortul fizic. Palestrica Mileniului III Civilzaţie şi Sport, Volumul III, 1 (19), 45-57

BUTNARIU, G. E. si COLABORATORII, 2009, *Exercise methodology in elderly*. Palestrica Mileniului III, Volumul X, 2 (36), 158-164

CHIRIŢI, G., DIMULESCU, D., M., *Gait Disturbances in Old People or Compensatory Mechanism for Falls Prevention.* Palestrica Mileniului III, Volumul X, 4 (38), 405-409

CRISTEA, E., 1990, *Terapia prin mișcare la vârsta a treia.* Bucureşti: Editura Medicală, 13-18

DRĂGAN, I., 2002, *Medicina sportivă*. Bucureşti: Editura Medicală, 504-519

LEACH, R., E., 2000, *Aeging and physical activity*: Ortopede, 29, (11), 215

MAVRITSAKIS, N., FREUNDICH, G., BOCU, T., 2008, *Răspunsul respirator la efortul fizic la vârstnici*. Palestrica Mileniului III Civilzaţie şi Sport, Volumul IX, Nr. 2 (32), 104-107

MAVRITSAKIS, N., FREUNDICH, G., BOCU, T., 2008, *Efortul fizic la vârstnici*. Palestrica Mileniului III Civilzaţie şi Sport, Volumul IX, Nr. 3 (33), 215-221

MAVRITSAKIS, N., GHIDRAI, O, 2009, *Activitatea fizică şi iatrogeniile psihice la vârstnici.* Palestrica Mileniului III Civilzaţie şi Sport, Volumul X, Nr. 3 (37), 298-302

POP, L., UNGUR, R., ONAC, I., TACHE, S., 2001, *Efortul fizic în cadrul programelor de recuperarea a pacienţilor de vârsta a III-a cu boală artrozică.* Palestrica Mileniului III, Anul II, nr. 4 (6), 69-74

PIIRINEN, M., J., AVELA, J., SIPPOLA, N., LINNAMO, V., 2010, *Age Dependency of Neuromuscular Function and Dynamic Balance Control*. European Journal of Sport science, Volume 10 (1), 69-79

POPESCU, A., 2009, *Vârsta a treia – plusuri și minusuri.* În: Articole de specialitate, 2009, 32-35

RUDMAN, D., 1990, *Effects of Human Growth Hormone in Men Over 60 Years Old.* New England Journal of Medicine, Volume 323 July 5, 1990 Nr. 1

TACHE, S., SÎRBU, C., 2001, *Răspunsul cardiovascular la efort fizic la vârstnici*. Palestrica Mileniului III, Anul II, nr. 4 (6), 57-68

www.sfatulmedicului.ro