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CHAPTER 8

The role of physical activities for patients infected with SARS-CoV-2 after convalescence period

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8.1 The COVID-19 illness and the beginning of the pandemic

“Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease and cancer are more likely to develop serious illness” (World Health Organization, 2020).

For persons infected with SARS-CoV-2, the virus affects the organs' vital functions (Asadi-Pooya & Simani, 2020; Connors & Levy, 2020; Fang, Karakiulakis, & Roth, 2020; Giacomelli et al., 2020; Panigada et al., 2020; Zhang et al., 2020) but especially the respiratory function (Astuti & Ysrafil, 2020; Xu et al., 2020).

The experts have proposed several treatments for COVID patients with a good rate of success (Cao et al., 2020; Chen, Xiong, Bao, & Shi, 2020; Fedson, Opal, & Rordam, 2020; Ko et al., 2020; Tang et al., 2020).

In the first stage of the pandemic, the state of emergency was established at the national level (Guvernul Romaniei, 2020) which limited the mobility of the population; only with special conditions could the people leave their homes. Because the pandemic started in winter and continued during spring, the weather conditions were another reason for the elderly to stay at home and avoid any activities outdoor.

During the first phase of the pandemic, the people stayed at home and in many situations they did not practice any physical exercises. Usually, they watched TV, news especially, and read articles concerning the evolution of the pandemic.

In that period of time (from March to May), there was not so much good news presented by mass media; hearing only bad news every day, the morale of the people/population decreased. In this context, the Stefan cel Mare University established a support telephone line in order to help the population to pass that bad moment. Psychologists,

sociologists, and social workers started to give online and telephone support for the vulnerable categories of the population.

The lack of physical activities for more than 2 months affected especially the physical fitness at all categories of the population.

The limited space for physical activities (only at home) and the lack of specific equipment's made many people become sedentary. The sedentary life affects people physically and mentally, along with a low level of life quality and the possibilities to develop certain diseases.

In order to avoid this situation I proposed some exercises that can be undertaken at home, and using one's own body weight to maintain or improve physical fitness.

During the workout it is recommended to use all body muscles in order to keep the entire body in a good shape.

8.2 Practicing physical activities

Practicing physical exercises over time in various forms has accompanied the development of human society, with physical and mental effects for those who practiced them. In the Contemporary Period, the possibilities of practicing different physical exercises for recreational purposes are very high, the only limitations being related to personal possibilities, desire, practice costs, and necessary equipment. In school, children should be educated to independently practice physical exercise during their free time according to their personal choices (Leuciuc, 2019a).

In order to highlight the aim of human motor skills, from a theoretical point of view in the structure of motor activities, the following typology is distinguished (Dragnea & Bota, 1999): physical education, sports, leisure activities, expression activities, and physiotherapy.

By practicing physical activities, a series of beneficial effects are obtained at individual level: positive self-image, fine perception of internal and external information, positive emotions related to motor learning, desire to practice motor activities (games, sports) during lifetime.

Regarding the activities that involve physical and mental effort (active), the basic means is physical exercise, which is considered the development or maintenance of fitness and, most importantly, of health.

Physical activities must solve a series of specific objectives in order to quantify their effects (Leuciuc, 2015a):

- maintaining an optimal state of health;
- fostering harmonious physical development;
- development of general and specific motor skills (education of motor qualities and formation of a system of basic motor skills and abilities, utilitarian—applicative, and particular to some branches of sport);

- development of the capacity for systematic and independent practice of physical exercises;
- harmonious development of personality;
- solving some social, personal, professional, and economic problems by eliminating/decreasing delinquency, violence, crime, and drug addiction;
- contribution to social, ethnic, professional integration;
- contribution to increasing professional efficiency by improving fitness and health;
- contribution to the prolongation of the active working age, of retirement, as well as to the improvement of the elderly condition and of those with disabilities.

Exercises are grouped into three large categories depending on the effects they have on the body (Leuciuc, 2019b):

- flexibility and stretching exercises that improve movement possibilities for muscles and joints;
- aerobic exercises that have the effect of improving cardiovascular endurance; and
- anaerobic exercises that improve short-term muscle strength and speed.

Those who practice physical activities for relaxation and recreation can be separated into three categories, depending on the amount of effort involved in practicing physical exercises (Leuciuc, 2015b):

- Sedentary people for whom physical activity is very low or completely absent, have a high risk of disease, life expectancy is low, and life quality is relatively low.
- Exercise practitioners for health and longevity have a lower degree of exposure to disease, longer life, and increased optimism; the effect of exercise is visible physically and mentally.
- Practitioners of athletic type exercise, who have a very good physical condition that allows them to participate in competitions, but who do not undertake excessive training, have the lowest risk of disease, high life expectancy, and an increased life quality.

8.3 Effort parameters in physical activities

In order to be effective, a program of motor activities must have a positive impact on one's health and the improvement of physical condition and must comply with several conditions related to the effort parameters: volume, duration, frequency, intensity, and complexity (Leuciuc, 2019a).

8.3.1 The volume of effort

The volume of effort represents the total amount of mechanical work performed and it is estimated by the number of repetitions, traveled distances, lifted kilograms, and duration. The volume is an important indicator of the increase of the aerobic effort capacity when its quotas are at the level that allows working with intensities adequate to one's physical condition (Leuciuc, 2019a).

8.3.2 The intensity of effort

The efficiency of a motor activity program is visible when the effort has certain intensity. Efforts that require caloric intake of more than 7.5 per minute significantly reduce disease. The ideal working intensity can be determined with the help of the training heart rate zone. For every age, there are indicated the maximum heart rate and the optimal heart rate range (between 60% and 90% of the maximum heart rate), which leads to an improvement for one's physical condition. The knowledge and the practice application of data regarding the training rate area require the possibility of correctly determining the pulse, by counting the pulsations of the radial jugular arteries. In order to achieve a correct count, the practitioner must be taught to evaluate her/his heart rate at rest, and then, following a physical effort practice (Leuciuc, 2019a).

8.3.3 The duration of effort

It is recommended that the duration of the effort be measured both in minutes and in consumed calories. Those who expend more than 2000 kilocalories a week through physical effort have a significant decrease in the risk of heart disease. These 2000 kilocalories can be distributed differently (Dumitru, 1997): 650–700 kilocalories in 3 days a week; 500 kilocalories in 4 days a week; 400 kilocalories in 5 days a week; 330–340 kilocalories in 6 days a week; 300 kilocalories every day of the week.

The minimum duration of a training session should be 40–45 minutes to observe positive effects over time.

8.3.4 The frequency of effort

To see the efficiency of a motor activity, it must be performed at least three times a week, with moderate intensity and duration. Performing activities with intense and long-lasting efforts are not beneficial to the body of leisure physical activity practitioners (Dumitru, 1997).

Achieving the goal of maintaining good physical condition is not desirable without at least three sessions of motor activities per week.

8.3.5 The complexity of effort

This is an effort parameter related to the number of motor actions performed simultaneously during an activity. Complex motor activities are coordinated by the central nervous system. The increase in the complexity of the motor actions leads to high stress on the nervous system, causing a faster onset of fatigue. Complexity has an insignificant influence on the body's aerobic and anaerobic effort capacity, compared to the other parameters in motor activities (Leuciuc, 2019a).

8.4 Physical activities at different age categories

In order to identify the optimal organization and development forms of physical activities, it is necessary to know the particularities of growth and development specific for every stage.

After 35 years old, the human body faces a deterioration of physiological functions, reduced joint mobility, muscle loss, weight gain, worsening of illness, and chronic diseases that have the effect of reducing the program of motor activities that can be practiced, and in some cases, the impossibility to perform daily tasks. The purpose of physical activities is to reduce the negative effects listed above and to promote an active and healthy lifestyle by practicing walking, jogging, running, skiing, Nordic walking (all with cardiorespiratory effects, implicitly on endurance), swimming (effects on cardio, strength, coordination), and gymnastics (mobility, tone, and muscle elasticity). After 35 years old, for every decade the physical fitness level decreases by 5%–15% and in order to maintain the health status it is recommended to practice at least 30 minutes of moderate to vigorous exercises every day.

The role of the local community and the factors involved in the phenomenon of sport for all must create facilities for practicing various sports for all age groups, as well as programs stimulating an active and healthy lifestyle.

8.5 Life expectancy

Life expectancy is the average life expectancy of an individual or the average number of years of life left at a certain age. Life expectancy depends very much on the criteria used to select the group (geographical area, historical period, living conditions, epidemics, wars).

Throughout history, the evolution of life expectancy has been upward, the exception of the rule being the periods of war and epidemics when there have been setbacks. The large margins for some historical periods are mainly due to the differences in development among the geographical regions of the world at those moments.

Life expectancy at birth in Romania at the beginning of the 20th century was 36.4 years; it reached 69 years in 1970. Data for 2017 indicate a life expectancy at birth of 71.7 years for men and 79.1 years for women (Eurostat, 2020b). With this average, Romania occupies globally a middle position (108th place out of 223) in terms of life expectancy at birth. The top is dominated by the developed countries where life expectancy is close to 90 years (the first place is occupied by Monaco with a life expectancy at birth of 89.57 years).

Eurostat data indicate a life expectancy in Romania at the age of 50 of 25.5 years for women and, respectively 22.1 years for men; and at the age of 65, the same indicator indicates 13.6 years for women and 12.3 years for men (Eurostat, 2020a).

The estimates for the following periods indicate a trend of increasing life expectancy in our country (2030: 76 years for men, 81.5 years for women; 2060: 81.8 years for men and 86.7 years for women).

8.6 Design of physical activity programs

In designing programs for physical activities, certain methodological aspects must be taken into account to ensure the involvement of practitioners and their success (Bota, 2011):

- balanced and varied program—taking into account the forms of organization of the team (frontal, in pairs, groups, or individually) and the alternation of the used means (exercises, games, relays, routes);
- sustainable promotion of recreational activities—by using those branches or elements of sports in accordance with individual characteristics, but also the preferences of practitioners (individual sports—running, jogging, swimming, cycling—or team sports);
- formative character of the activity—for the optimal choice of the way of practicing the physical exercises according to one’s personal motivation, so that the offer must be wide and generous in order to have where to choose the individuals;
- correlation between physical and mental effort, and the promotion of positive personality traits;
- gradual introduction of the elements of competitiveness;
- wide public and community utility;
- promotion and social integration;
- ensuring an optimal workout time (volume) depending on the potential of practitioners;
- alternating aerobic activities with anaerobic ones;
- ensuring a moderate and submaximal intensity in the performed activities (60%–90%)—related to the maximum heart rate;
- alternative request of all muscle groups;
- weekly frequency of the program/activity—minimum three times;
- need to assess in advance the health of those who want to exercise.

The aspects presented above have the role of guiding the design of the activities program taking into account the availability and motivation of the individuals to practice physical exercises and the level of their physical condition.

8.7 The effects of diseases on the human body

The disease state occurs as a result of the harmful action of various environmental factors that produce morphological and functional changes in the body and affect the

activity at different functional levels by limiting the adaptive capacity and reducing the workout capacity. Harmful factors can affect one or more anatomical and physiological systems of the body, and the intervention to eliminate the disease leads to the application of various medical procedures (operations, drug treatment) to eliminate the cause. The body's fighting capacity is also conditioned by the state of the immune system, age, season, previous medical history, and genetic inheritance. In the case of mild forms of the disease, if the treatment established by the doctor is not followed, it can lead to more severe forms and to its chronicity. In order to limit the harmful effects of diseases on the body, it is necessary to have a balanced lifestyle, a healthy diet, regular exercise, regular medical consultations, and medical tests for prophylactic purposes (Leuciuc, 2019b).

8.8 Healthy habits for a good quality of living

The formation of healthy living habits that involve the practice of physical exercises is done gradually, and the effects appear in time, both physically and mentally, if the program is respected. To this end, objectives must be set, which must be achieved and which are measurable, these objectives being referred as SMART (Specific, Measured, Action, Realism, Timing) (Singh, Benett, & Deuster, 1999):

- setting specific objectives that can be achieved through training within a reasonable time horizon;
- results obtained are measurable, so that the practitioner can observe for himself the made progress, these having a stimulating effect for the continuation of the activity;
- action orientation in order to find optimal workout exercises to achieve the objectives;
- developing a realistic implementation plan, adapted to the possibilities of practitioners, with both long-term and short-term goals/objectives; and
- setting deadlines for achieving the specific objectives which should be accessible and ensure progress.

8.9 Practicing physical exercises by using applications to monitor effort and recover the respiratory function

Due to the fact that the Coronavirus affects especially the respiratory function, after the convalescence period it is recommended to practice some breathing exercises and low to moderate intensity physical activity. In order to regain the respiratory deficit I recommend the following exercises:

1. Meditation and focus on breathing act, 5–15 minutes.
2. Yoga exercises and focus on breathing act, 5–15 minutes.

3. Tai-chi and focus on breathing act, 5–15 minutes.
4. Walking, 500–1000 m.
5. Jogging, 1000–1500 m.
6. Nordic walking, 1000–2000 m.
7. Running, 1000–3000 m.
8. Cycling, 3–10 km.
9. Swimming, 100–400 m.

All these exercises could be practiced according to the personal health status and physical fitness. At the beginning it is recommended to start breathing exercises and to gradually increase the intensity of the effort.

One way to assess pulmonary total capacity is to use spirometers. Average values for healthy people are between 4500 and 7000 mL (Beers, Porter, Jones, Kaplan, & Berkwits, 2009; Motcovschi & Ţernă, 2003).

In order to regain optimal respiratory function at optimal level it is recommended to practice low and moderate physical activities (according to the personal potential).

It is recommended to measure monthly the pulmonary total capacity of patients affected by Coronavirus during the convalescence period.

To improve the pulmonary total capacity it is recommended to practice regular (daily, if it is possible) physical activities.

Because after a state of illness the physical fitness is low it is recommended to start the physical activity gradually. Starting from the principle of accessibility, the first activity that can be approached very easily is walking—which best solves the problem of exercising for a person who wants to practice physical activities on a regular basis.

For those who choose to practice physical activities regularly, there are three stages that lead to a good physical condition. In the first stage, the speed and distance must ensure that the route is covered easily. Gradually, both the distance and the speed will increase, reaching 6 km at an alert pace, 3–4 times a week. In this stage of accommodation, the practitioners must be taught to take their pulse, both during and after the effort, this being a qualitative parameter of the effort made. The objective of the second stage is to improve the physical fitness, in which case the grading of the effort must be done progressively. It is the stage in which the transition to jogging and running is made, alternating with periods of walking for recovery. The use of jogging and running has the effect of increasing the intensity of the effort, compared to the previous stage. During this stage, the distances or periods of jogging, running, and walking must be alternated, and toward the end, the running distance must be increased and the walking distance must be reduced. The end of this stage occurs when the distance covered by running, without a break, reaches 5 km. In addition to the exercises presented, others can be practiced that ensure at least the same intensity of effort and adequate caloric intake (cycling, swimming). In the third stage, the workout can be individualized according to the potential of effort and the preferred activity. The

activity can continue with walking and running or, depending on the individual's option, with other individual or collective forms of physical activity practiced indoor or outdoor. Physical activities strengthen and give a good condition to the musculoskeletal system, increasing the body tonus and endurance. Improvements of mental health, boosting self-esteem, and self-confidence have also been observed (Leuciuc, 2015c).

Stretching involves a state of mental comfort, comfortable working positions, individual work, stimulation of all muscle groups (but in turn), calm, controlled breathing, good warm-up of the musculoskeletal system, and daily work. The method can be defined as a system of exercises that involves keeping a segment in a certain position, for a short time, on the order of seconds, in order to gradually stretch a muscle and prepare it for the specific exertion. The exercises used in this method positively influence joint mobility. Active movements should be performed with medium speed, maximum amplitude, and deep exhalation that reduce muscle tone. Each stretching exercise must be followed by a relaxation exercise. Maintaining the position in passive exercises can take between 1 and 5 minutes, within the limits of the tolerability of a slight pain. The time to perform the stretching exercise varies between 6 and 30 seconds. By maintaining the muscle, it initially contracts reflexively, and then decontracts by elongation. The duration of maintenance varies depending on the exercise, the individual, and the expected effects. A program of exercises selected in order to solve the problems of elasticity for the muscle groups requires 4–5 repetitions, with breaks (10–15 seconds). The use of stretching exercises according to the contraction–relaxation–tension algorithm contributes to reducing muscle problems, being effective for maintaining or increasing muscle elasticity, joint mobility for those who practice sports, but also for those with reduced physical activity or inactivity due to accidents; the effects of stretching exercises being limiting, reducing muscle atrophy (Leuciuc, 2019c).

The effects of stretching exercise are to improve muscle tone; contribute to the harmonious physical development of the body; contribute to the formation of a correct position; restore the body's capacity for exertion; establish a balance between mental and physical activity; and are an effective means of muscle relaxation (Simion & Simion, 2006).

Stretching is a simple method of muscle and joint processing with high results in sports training or sport leisure activities. It contributes to the selective processing of the musculoskeletal system as well as to the improvement of muscle elasticity and joint mobility. Stretching is a method of selective processing of body muscles, warming the body in order to make intense efforts in sports training regardless of age, gender, and previous training. It addresses all practitioners with effective results. Stretching exercises contribute to the return to normal limits of muscle tone after exertion and to the positive influence of the activity of the major functions of the body (locomotion,

circulation, and respiration). Through these exercises a better engagement of the body in effort is achieved, injuries and traumas are reduced in different muscle groups and joints, and after exercise the vital functions of the human body are restored to higher parameters in order to continue the effort (Leuciuc, 2019c).

Melotherapy is a form of therapy used since ancient times. The positive effects on the mental and physical level indicate melotherapy to be a primary or complementary method in treating patients. By using music in the medical act, a climate of safety and comfort is created for patients regardless of age and in most diseases. Musical sounds cause the release of dopamine in the brain, which induces well-being and reduces the feeling of fatigue and pain (Leuciuc, 2019b).

Many studies indicate benefits of using music for therapeutic purposes in the following directions: mental disorders and affective (Orjasaeter & Ness, 2017), depression (Geipel, Koenig, Hillecke, Resch, & Kaess, 2018; Lin, Huang, He, Gu, & Wu, 2017; Ray & Mittelman, 2017), anxiety (Cakmak et al., 2017; Geipel et al., 2018; Ghezjeljeh, Ardebili, & Rafei, 2017; Jayakar & Alter, 2017), stroke (Orjasaeter & Ness, 2017), pain (Cakmak et al., 2017; Ghezjeljeh et al., 2017), asthma (Sliwka, Wloch, Tynor, & Nowobilski, 2014), Alzheimer's disease (Kampragou, Iakovidis, Kampragou, & Kellis, 2017), cardiovascular disease (Jayakar & Alter, 2017), autism (Cibrian, Pena, Ortega, & Tentori, 2017), dementia (Ray & Mittelman, 2017), palliative diseases (McConnell & Porter, 2017), neurological recovery (Sihvonen et al., 2017), and minor cognitive impairment (Mahendran et al., 2017).

The ideal work intensity can be determined with the help of the training heart rate zone which includes two axes: vertical (for heart rate) and horizontal (for age). For each age is presented the maximum pulse and the optimal range of heart rate (between 60% and 90% of the maximum heart rate) which leads to improved physical condition and health. For example at the age of 50 the maximum heart rate is 170 beats per minute ($220 - \text{age}$), the lower limit the training heart rate zone is 60% of 170 (102 beats per minute), and the higher limit 90% of maximum heart rate (153). The physical activity that allows working at a heart rate between 102 and 153 beats/minute is recommended, being effective for protecting the heart, improving aerobic exercise capacity, and effective for fat burning and cardiovascular performance (Leuciuc, 2019a).

In physical activities a scale is used to indicate the level of exertion perception, the most often used is the Borg scale of exertion perception (RPE scale), which has a value between 6 (minimum, rest) and 20 (maximum effort) of the effort made. The use of the interval 6–20, is based on the physiological consideration according to which if we multiply the value on the scale by 10 it should indicate the heart rate that the individual has at that moment, in accordance with the intensity of the effort made. Because the subjective factor appears, it is very important for each participant to assess in a more objective way his own level of perception of effort and not compare to

other people, according to the scale: for the value 6 the body does not make any effort, for score 9, which corresponds to a very easy effort, an example is walking at your own pace. Values between 12 and 14 indicate a moderate intensity of effort. Level 13, corresponding to somewhat difficult, indicates an increase in intensity, but the body responds normally and the effort can be continued. At score 17 the intensity is very heavy, fatigue occurs, requiring an effort of will to continue, and the practitioner is very tired. Level 19 is extremely difficult, in most cases it is the most intense level they have reached in the practice of exercises (Borg, 1982, 1998a, 1998b).

In order to monitor and to manage the activity, it is recommended to use specific applications as an objective tool.

There are a lot of gadgets and applications that can be used to monitorize the physical activity.

In these special conditions of practicing physical activities, the most useful applications were caloric counter, workout diary, and nutritional journal. These apps can be installed on ones phone. The person must fill some personal information (age, weight, height, meal plan, daily physical activities practiced) and in that way, they will have objective information and advice to follow for a healthy lifestyle.

The use of these new technologies may not be a strong feature for all categories of people, but they can learn how to use these things in order to monitor their daily activities, to improve their life quality and life expectancy, and to be active and autonomous for a longer period of time.

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