Spinal training with towels during the covid period because of prevention and rehabilitation



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Abstract

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The novel disease of the 20th century is the COVID-19 virus, which turned the world upside down and affected both emotional and economic life on a global scale. It rewrote our previous lifestyle and forced new habits on the population, which, although on the one hand, were useful (reduction in traffic and the emission of harmful substances, more outdoor leisure activities, further expansion of the online space, etc.), on the other hand, they restricted the freedom of movement for many people, therefore weakening the strength of the skeletal muscle system and respiratory system, which have already been in critical condition, making them more susceptible to the harmful effects of the virus. The most common complication of COVID-19 is respiratory failure. Unwanted effects include deterioration/scarring/destruction of lung tissue, decreased vital capacity of the lungs, resulting in a decrease in blood oxygen level (SpO2), increased fatigue of muscles (striated/smooth and cardiac muscles), so in COVID-19 patients many forms of myocardial damage appear/may appear to this day. The effect on the myocardium appears to be multifactorial, which is the result of multiple organic failure (kidney: in the disease caused by COVID-19, acute kidney damage appears in 0.5-15%, and the liver: transaminase increase in 21-37% of the cases, as well as three times the value of GOT and GPT is visible), many patients experience shortness of breath because of this (heart failure), not only because of the involvement of lung tissue. Severe lung changes lead/can lead to hypoxic vasoconstriction, thromboembolism, pulmonary hypertension and irreversible right heart failure. As you can see, COVID-19 has resulted/results in a multitude of long-term complications, and an effective treatment requires a very diverse solution.

In my current thesis, I looked for the answer to how much the COVID-19 epidemic that took place in recent years and the accompanying home office work/online learning (which has remained up in many places since then) has/is currently deteriorating people's respiratory functions and the effectiveness of rehabilitation , their return to normal life. It is also necessary to determine the functional capacity of the respiratory muscles, as both the skeletal and respiratory muscles become sarcopenic during the course of the disease. I did this indirectly by measuring breathing parameters (vital capacity) with the dedicated help of the staff of the Lung Care Institute of the Baja Hospital. The purpose of the study would be to prove that the five spine exercises I have put together, which only take a maximum of four minutes, can effectively increase the respiratory vital capacity in the short term, and in the long term can also correct the posture, so that the lungs can work more efficiently in everyday life. Well-done gymnastics can therefore correct bad posture and increase the strength of the muscles that stabilize the spine, which weaken over the years from long-term sitting and stooping, and the majority of their development is time spent at school, in the home office, or in an armchair in old age. plays a role. Several studies describe the conditions associated with muscle atrophy resulting from incorrect sitting, posture errors and the resulting organ changes, which thus bring with them a reduced respiratory function, which is favorable for viruses and bacteria. In the research, I wanted to use a single aid that can be used during everyday life (and hopefully found in every household), which is none other than the towel. With the help of this simple tool, we can significantly fight the 21st century. century folk disease, against spinal disorders caused by sitting and reduced lung capacity. The Covid-19 epidemic, which began at the end of 2019, was declared a global pandemic by the World Health Organization (WHO) on March 11, 2020. (vaccination-info.eu, 2021)

This is the first coronavirus to cause a pandemic. The peak of the pandemic unfortunately caused many people to become and are currently infected with the many mutations of COVID-19. However, not only the COVID-19 virus is responsible for respiratory problems in all cases, but the incorrect posture itself and the resulting reduced breathing surface can be a breeding ground not only for COVID-19, but also for other pneumonias. The wrong way of sitting accompanies a person's life from elementary school (from about 6 years of age) until the end of studies (about 14-18 years of age or higher in the case of university). In many cases, if a person does a job that consists mainly of sitting (drivers, accountants, computer jobs, etc.), long-term spinal and respiratory damage can indeed develop. And at the very end of the life cycle, when active movements decrease, such as in retirement, sitting becomes predominant, which also reduces the mobility of the spine, breathing and breathing surface, and the dust damage suffered over the years and increasing air pollution also increase these problems. (WHO, 2021)

Objectives:

The purpose of my research is to map and assess the change in vital capacity among people who have experienced COVID-19 or pneumonia using a spinal exercise that I have put together with a towel (or a similar aid, e.g. in extreme cases, a piece of clothing of the right size). In all cases, the goal would be the vital capacity and a higher level of oxygenation of the

body. For the healthy, the plan would be to prevent the spine and strengthen the lungs and the upper spine section, while for the affected group, the goal would be to regain the mobilization of the spine and restore the reduced capacity of the lungs.

Also, after the evaluation, I would like to present the results to physiotherapists and coaches for preventive purposes, which draws attention to the importance of performing regular exercises that can be performed anywhere, for both groups. My goal is also to initiate the involvement of the public and teachers in the exercises later on, as this way even beginners (children and the elderly) can perform the various exercises more safely and develop the strength of both the spine and the lungs.

Literature review

In connection with COVID-19, the patients who suffered from the infection were also examined in the domestic context, several of whom reported lingering complaints after recovery. Many people experienced persistent cough, dyspnoea, chest pain, and shortness of breath, regardless of whether the coronavirus appeared with mild or more severe symptoms. Patients reported weakness with a strong feeling of fatigue, while others developed gastrointestinal complaints, headaches, depression, and loss of sense of smell and taste. Countless studies have shown that the infection caused by COVID-19 can affect lung function even months later, and the effects of the infection on the lungs can also be seen in the chest CT control findings three months after recovery. That is why a pulmonary examination is necessary after the infection has passed, if the patient has prolonged complaints or if the disease has caused pneumonia. In addition to the currently operating inpatient respiratory rehabilitation, it is also necessary to extend the treatment on an outpatient basis, the aim of which is to achieve a complete recovery of patients without further hospitalization. In patients with COVID-19 infection, as a result of complex rehabilitation, load capacity and quality of life improve, respiratory function values improve, complaints decrease, and the patients' physical and psychological condition improves. The aim of their summary research was to review what kind of outpatient rehabilitation programs for COVID-19 have been started for patients with coronavirus infection in international and domestic arenas (Fekete et al, 2021). The beneficial effects of pulmonary rehabilitation should be used in patients who have been in bed for a significant period of time after long-term ventilation of seriously ill patients, as well as in patients with significantly restrictive respiratory disorders and hypoxic conditions. In connection with this, the beneficial effect on the cardiovascular, metabolic, respiratory and peripheral muscles and the breathing mechanics must also be taken into account. Among these patients, especially elderly patients with respiratory insufficiency and significant comorbidities require close attention, during which the process must be managed by a respiratory rehabilitation specialist and the care must cooperate as a team. In terms of the team, in addition to the respiratory rehabilitation specialist, physiotherapists, psychologists, dietitians and well-trained respiratory nurses played and continue to play a significant role. (Varga, Madurka, Boros, Czibók... & Szilasi, 2021)

There is now a consensus that after COVID-19, physical activity, especially sports, can be started after at least seven days of complete absence of complaints and symptoms. This also applies to any other strenuous physical work or activity. It is recommended to divide the physical load into sections. During the program, the patient must be taught to constantly evaluate the level of effort associated with exercise (based on the Borg scale), keep a diary, and regularly inform the doctor about his progress. Smart devices and telemedicine solutions can help a lot in this. A significant number of smart watches now also have a heart rate monitor, and are also suitable for measuring oxygen saturation, blood pressure and heart rate, which the patient can transmit to the doctor. In the first and second stages, only very light physical activity is recommended for at least two weeks. At first, we can only do light exercises, breathing exercises, stretching and relaxing the muscles, maintaining balance in a calm state. In such cases, only a short walk is recommended. The level of effort should reach the sixth to eighth degree. If there are no complaints and adequate tolerance, the load can be increased, so this corresponds to a walk no longer than 15 minutes a day, light yoga, housework, gardening.

The amount of effort associated with physical activity should gradually increase from the sixth grade to the 11th grade. If there is adequate progress, at the end of the second week, the patient can already take a 30-minute easy walk. In the third phase, aerobic and strength exercises of moderate intensity can be performed, for example, with five minutes of aerobic exercise, followed by a five-minute break, and then another five-minute exercise. If there are no complaints, the load can be increased daily in five-minute intervals, the recommended effort level is 12-14. degree (feeling of a light but somewhat heavy load). In about seven days, it is possible to achieve that the duration of the exercise is 30 minutes, and after an hour the patient can rest from the fatigue. In the fourth stage, the aerobic and strength exercises used so far can be supplemented with loads that increase coordination and function. Two days of exercise are followed by one day of rest. The level of effort is 12-14. degree. At the end of

this phase, the expected result is that after the load, the patient should feel normal fatigue, which was usual before the disease. In the fifth stage, by gradually increasing the intensity and duration of the load, it is possible to reach the regular, previously usual level of physical activity. The level of effort associated with the load exceeds the 15th degree. The severity of the course of COVID-19 varies from person to person, so the consequences are also different. Only with a personalized program and close cooperation between the medical staff and the patient can it be achieved that the person who has suffered from COVID-19 can regain their usual, everyday activities and fulfill their former social role (Vályi, 2021).

During research among patients suffering from heart, lung, neuromuscular diseases or possibly overweight, it was established that body position has a great influence on the quantity and quality of breathing. One of the main goals of using positioning, and especially upright positions, is to improve lung function in patients with respiratory disorders, heart failure, neuromuscular disease, spinal cord injury (SCI), and obesity. Over the past 20 years, various studies have been published on the effect of posture on respiratory mechanics and/or function. However, no systematic review was found that integrated the results of studies in non-mechanically ventilated adults to derive clinical implications for respiratory care and pulmonary function test (PFT) performance (Katz, Arish, Rokach, Zaltzman & Marcus, 2018).

Spinal Training with Towels During the COVID Period: Prevention and Rehabilitation

The COVID-19 pandemic has significantly impacted our daily lives, including our physical activity levels. Many people have found themselves spending more time indoors, leading to a decline in overall fitness and an increased risk of musculoskeletal problems, particularly in the spine. Spinal problems can arise from various factors, including poor posture, sedentary lifestyle, and repetitive movements.

To address these concerns and promote spinal health during the COVID-19 period, incorporating spinal training into your daily routine can be highly beneficial. Using a simple and readily available household item – a towel – you can effectively strengthen your spinal muscles, improve flexibility, and reduce the risk of injuries.

Benefits of Spinal Training with Towels

Spinal training with towels offers several advantages, making it an ideal exercise regimen for both prevention and rehabilitation:

Ease of Use: Towel-based exercises require minimal equipment and can be performed almost anywhere, making them highly accessible.

Safety and Comfort: Towels are soft and comfortable to use, reducing the risk of injury and allowing for a wide range of movements.

Versatility: Towels can be used for a variety of exercises, targeting different muscle groups and addressing various spinal conditions.

Cost-Effectiveness: Towel-based exercises do not require expensive equipment, making them an affordable option for individuals with limited financial resources.

Home-Based Rehabilitation: Towel exercises can be easily incorporated into a home-based rehabilitation program, promoting recovery from spinal injuries or conditions.

Spinal Training Exercises with Towels

Here are some simple yet effective spinal training exercises that we can perform using a towel:

Towel Stretches: Towel stretches are excellent for improving flexibility and reducing muscle tension in the back and neck. Lie on the back with knees bent and feet flat on the floor. Place a towel under the lower back, extending it towards to head. Hold one end of the towel in each hand and gently pull the towel towards to head, creating a stretch in the back and neck. Hold for 15-30 seconds and repeat 2-3 times.

Towel Extensions: Towel extensions target the erector spinae muscles, which are responsible for maintaining spinal alignment and supporting the back. Stand with on feet shoulder-width apart and hold a towel in each hand. Extend the arms overhead, keeping the towel taut. Gently lean back, feeling a stretch in the back muscles. Hold for 15-30 seconds and repeat 2-3 times.

Towel Pull-Throughs: Towel pull-throughs strengthen the abdominal muscles, which play a crucial role in supporting the spine and maintaining proper posture. Stand with on feet hip-width apart and hold a towel in each hand. Slowly bend forward, keeping your back straight,

and grasp the towel ends together in front of the toes. Gently pull yourself forward, feeling a contraction in the abdominal muscles. Hold for 2-3 seconds and repeat 10-15 times.

Remember, consistency is key to achieving optimal results. Aim to perform these exercises 2-3 times per week, gradually increasing the number of repetitions as you get stronger.

The compilation below contains the 5 exercises that I also used in the current research, and based on this, we measured the effectiveness of the exercise series in the hospital and the increase/increase of vital capacity among the patients who volunteered.

It took about 4 minutes to perform the exercises after proper training with slow deep inhalations and five repetitions per exercise. These exercises, when performed properly, significantly influenced the strength of the respiratory muscles, their functioning, and thus the blood oxygen level, both in the short and long term. After the first exercises, according to the pulse oximeter, the blood oxygen level decreased almost immediately, but due to the deep inhalations, the ability of the lungs to absorb and exchange oxygen improved, which was accompanied by an increase in the SpO2 level. The exercises are shown in the following figures.

If we do the exercises correctly and dedicate these few minutes to ourselves, then the tournament will take place routinely. The body will initially react to the changed posture with some muscle fever, but after the muscles are reactivated, the movements of the rib cage will also be more flexible. For the first couple of exercises, it is worth asking for the help of a physiotherapist to avoid incorrect patterns and positions, but to develop the correct posture. It also applies here that what does not work or is painful should not be forced. This is especially true for shoulder pain. Let's pay attention to the contraindications. In the following, the execution of the gymnastic exercises in a sitting position using a towel will be presented.

Breathing exercises and spine mobilization exercises that can be performed with a towel

First exercise:

Starting position: sitting position

• We hold the towel in our hands and place it on our knees as shown in the picture (picture 1). The shoulders are lowered and relaxed as much as possible. • From this position, we stretch above our head with outstretched arms (picture 2), while inhaling deeply into the chest through our nose.

• Letting the hands in front of us, we return to the starting position (picture 3), while blowing out the air through our mouth.

Number of repetitions: 5x



In the first image, the goal was to warm up the diaphragm and back muscles. During manual elongation and deep inhalation, the diaphragm lowers and when the arms are raised, the muscles of the upper back (m. trapezius p. superior, m. levator scapulae, m. rhomboideus minor et major) are involved.

On the other hand, when the arm is pulled down, the front muscle groups of the chest work actively (m. pectoralis minor, m. trapezius p. inferior m. serratus anterior). It is important to set the correct sitting position in this position, which should preferably be maintained during the exercises. Feet on the ground, knees-hips at a 90-degree angle. It's okay here if the upper body is still slightly bent forward. When stretching, make sure to stretch upwards when raising your hands, and try to stretch with your head as well, thereby mobilizing the rib cage and long back muscles.

Second exercise:

Starting position: sitting position

• Hold the towel tight with your arm extended above your head and exhale through your mouth. (picture 4)

• Then pull both of our hands down to the back of our head so that our elbows are as close to our sides as possible and we try to close the shoulder blades at the back. (Picture 5: towel pulled over the back of the head and inhalation). Then inhale deeply through the nose, stretch up again and exhale. (picture 5)

Number of repetitions: 5x



During the second exercise, the goal was to strengthen the shoulder blades. When pulling down, squeeze or try to close the shoulder blades at the back as much as possible.

When raising your arms, stretch as much as you can, this also helps the scapulothoracic rhythm.

It is important to teach the movement sequence correctly in order to avoid the rotation of the shoulders in and out, thereby also possible shoulder pain. This exercise is done in the frontal plane with the help of a towel in accordance with the movement of the "Wall Angels". Let's pay attention to the breathing here, because while in the previous exercise we took a deep breath when stretching, now we have to take a deep breath when pulling the arms down. In this cycle, the chest almost "swells" from inhalation, thereby also mobilizing the rib cage.

When exhaling, stretch both hands above the head and relax the muscles of the shoulder girdle and back.

Between the second and third exercises, it is worth taking a short break (at first after the initial illness). Then we put the towel on our neck, slightly stretched on it, with our hands stretched forward, we can massage the neck with the stretched towel, improving and stimulating its blood circulation and preparing the third exercise with it. If there is a headache caused by the posture (see above under tension of the suboccipital muscles, connection of the fascia), then with the help of the towel, the neck exercise developed by Mulligan can be added to the range of motion as needed. After reworking the neck muscles, we can prepare for the following exercises. If you get into a routine during the gym, you can work with the towel continuously, so you can complete the entire range of motion in a few minutes, anywhere.

Third exercise:

Starting position: sitting position

• On the towel pulled over the back of the head, hold the towel taut with your hand, this will be the starting position and the position of inhaling through the nose. (picture 6)

Our two shoulder blades should be closed again in this position, let's lower our shoulders and push our chest forward.

• Lean forward from the upper back and close the two ends of the towel in front of you while exhaling forcefully through your mouth. (Image 7).

Then straighten up again and close the shoulder blades while inhaling deeply through the nose.

Number of repetitions: 5x



In the third exercise, we also start from the hand position with a towel stretched behind the back of the head. The shoulder blades should be closed as much as possible. Here too, pay attention to the rotation of the shoulders. The sequence of movements takes place in the sagittal plane in this case with the spine. We lean forward with our hands clasped in front of our face, almost squeezing the air out of us.

If there is phlegm, this movement can also be used to cough up. When straightening up, we open our two hands like a book, opening the chest and at the same time closing the shoulder blades at the back. Make sure that, if possible, the movement is carried out from the spine with the help of the back muscles. If someone is a little more flexible, they can also add some extension/homority when straightening up. By opening the arms and closing the shoulder blades, force a deep inhalation through the nose.

Fourth exercise

Starting position: Sitting position

• Put your left hand on your chest as shown in the picture (picture 8), and with your right hand, stretch up towards the ceiling (if there is one) while inhaling. Try to close your right shoulder blade in this position and inhale deeply through your nose.

• Reach down next to your left knee and then blow out the air through your mouth (picture 9). From here, stretch your right hand back up high while inhaling. We repeat this exercise on the left side as well.



The fourth exercise is performed on both sides, if possible. The movement is carried out on a diagonal movement path. We combine the sagittal spine and rib cage rotational movement in this combined exercise. As shown in the picture, lie down on the opposite side next to your knees as far as possible and as far as the towel allows. If we do the exercise well and the towel is properly stretched around the neck, we can also improve the rotational movement of the neck and the functioning of the neck muscles. Exhale when stretching down next to the knee. When stretching, also stretch in a diagonal direction. Let's look after our hands, mobilizing the neck. At the same time as stretching, take a deep breath through the nose. When teaching gymnastics (in early rehabilitation), the hand on the chest can help to feel the breath by asking the patient to inhale the air under the hand on the chest.

Fifth exercise:

• Put the towel on your waist so that your elbows are at right angles and your thumbs are pointing forward (picture 10). Squeeze your elbows to your sides and open your hands as shown in the picture.

• Close the shoulder blades at the back and tilt our pelvis forward (concave). Then we inhale deeply through our nose and pull our chin in, and stretch upwards with the top of our head (picture 11).

• Bend forward and close your hands, and lower your head as well, while exhaling forcefully through your mouth (picture 12).

Number of repetitions: 5x



For the fifth exercise, the movements are similar to the third exercise. Here, we not only work on the upper back section of the spine, but as far as the patient's condition (medically, physically and the condition of the spine) allows, we try to involve the entire spine in the movement from cranial to sacrum. We work with the towel around our waist. We close the shoulder blades and open the hands in the starting position.

Here, we pay attention to the position of the entire spine itself, so that the physiological curvatures of the spine are restored at least in this position. In the open hand position, we tilt the pelvis forward (we can facilitate this with the towel) and close the shoulder blades, at the same time we pull in the chin to bring the forward head posture in the upper crossed syndrome described above back to a physiological position. We bend forward while closing our hands in front of us, then exhale as much as we can. When standing up, open your hands and take a deep breath. The spine moves in the saggital plane here as well.

Additional Tips for Spinal Health

In addition to towel-based exercises, incorporate these additional tips to promote overall spinal health:

Maintain Proper Posture: Good posture helps distribute weight evenly across the spine, reducing stress and strain on the back muscles.

Engage in Regular Physical Activity: Regular exercise, including strength training and cardiovascular activities, helps strengthen muscles and improve flexibility, which supports spinal health.

Maintain a Healthy Weight: Excess weight puts additional stress on the spine, making it more prone to injuries. Maintaining a healthy weight helps reduce this strain.

Get Sufficient Sleep: Sleep is essential for muscle repair and overall health. Aim for 7-8 hours of quality sleep each night.

Manage Stress Effectively: Chronic stress can contribute to muscle tension and back pain. Find healthy ways to manage stress, such as yoga, meditation, or spending time in nature.

By incorporating spinal training with towels into the daily routine, coupled with these additional tips, it can effectively promote spinal health, prevent injuries, and enhance the overall well-being, even during the COVID-19 period.

This thesis was prepared on the basis of my master's degree, the research part of which I completed in Hungary in 2022-2023 at the Baja Hospital after the pandemic.

References:

- 1. Berntsen, S., Edvardsen, E., Carlsen, K-H, Kolsgaard, MLP & Carlsen, KCL. (2010). Effects of posture on lung function in obese children. <u>https://onlinelibrary.wiley.com/doi/10.1111/j.1752-699X.2010.00227.x</u>
- Bogos, K., Temesi, G., Kerpel-Fronius, A., Madurka, I., Szilasi, M., Varga, J. & Kovács, G. (2021). A COVID-19 vírusfertőzésen átesett - és visszamaradó károsodásokat szenvedő – POSZT-COVID SZINDRÓMÁS betegek gondozási protokollja. Országos Korányi Pulmonológiai Intézet. www.tudogyogyasz.hu/Media/Download/30445
- 3. Fekete, M., Szarvas, Zs., Fazekas-Pongor, V., Kováts, Zs., Müller, V. & Varga, JT. (2021). Ambuláns rehabilitációs programok COVID–19-betegek számára. [Outpatient rehabilitation programs for COVID-19 patients]. Orv Hetil., 162(42): 1671–1677.
- Gloeckl R., Leitl, D., Jarosch, I., Schneeberger, T., Nell, C., Stenzel, N., Vogelmeier, CF., Kenn, K. & Koczulla, AR. (2021). Benefits of pulmonary rehabilitation in COVID-19: a prospective observational cohort study. ERJ Open Res., 7: 00108-2021; DOI: 10.1183/23120541.00108-2021

- 5. Gobertpartners.com. Mi az a fev1 a spirometriában? <u>https://gobertpartners.com/what-is-fev1-in-spirometry</u>
- Han, J., Park, S., Kim, Y., Choi, Y. & Lyu, H. (2016). Effects of forward head posture on forced vital capacity and respiratory muscles activity. J Phys Ther Sci, Jan;28(1):128-31. doi: 10.1589/jpts.28.128
- Jang, H-J, Kim, M-J. & Kim, S-Y. (2015). Effect of thorax correction exercises on flexed posture and chest function in older women with age-related hyperkyphosis. J Phys Ther Sci, Apr;27(4):1161-4. doi: 10.1589/jpts.27.1161
- Kang, KW., Jung, SI., Lee, DY., Kim, K. & Lee, NK. (2016). Effect of sitting posture on respiratory function while using a smartphone. J Phys Ther Sci, May;28(5):1496-8. doi: 10.1589/jpts.28.1496
- Katz, S., Arish, N., Rokach, A., Zaltzman, Y. & Marcus, E-L. (2018). The effect of body position on pulmonary function: a systematic review BMC Pulm Med, 11;18(1):159. doi: 10.1186/s12890-018-0723-4
- Kim, MS., Cha, Y-J & Choi, J-D. (2017). Correlation between forward head posture, respiratory functions, and respiratory accessory muscles in young adults. J Back Musculoskelet Rehabil, 3;30(4):711-715. doi: 10.3233/BMR-140253.
- Koseki, T., Kakizaki, F., Hayashi, S., Nishida, N. & Itoh, M. (2019) Effect of forward head posture on thoracic shape and respiratory function, J Phys Ther Sci, Jan;31(1):63-68. doi: 10.1589/jpts.31.63
- 12. Súlypont Ízületklinika (2011). A légzésben résztvevő izmok... <u>https://www.sulypont.hu/blog/egyeb/a-belegzesben-szerepet-jatszo-izmok-edzese-</u> <u>noveli-a-sportteljesitmenyt</u>
- Szentágothai János Réthelyi Miklós: Funkcionális anatómia (Medicina Kiadó 1989) ISBN 963-241-789-5.)
- Sandra S. (2021). A COVID-19 (koronavírus okozta megbetegedés) kezelési lehetőségei a fizioterápia eszközeivel, kiemelt figyelemmel a fototerápia eddigi eredményeire. Belügyi Szemle, 69(3):431-445.
- 15. Szekanecz, Z. & Vályi-Nagy, I. (2021). Posztakut COVID–19 szindróma. Orvosi Hetilap, 162(27):1067–1078.

- 16. Thomas, P., Baldwin, C., Beach, L., Bissett, B., Boden, I., Gosselink, R., Granger, CL., Hodgson, C., Holland, A., Jones, AYM, Kho, ME, Lee, van der L., Moses, R., Ntoumenopoulos, G., Parry, SM & Shane Patman (2022). Physiotherapy management for COVID-19 in the acute beyond: hospital setting and an update to clinical practice recommendations. Hungarian translation. Journal of Physiotherapy Volume 68, Issue 1, January 2022, Pages 8-25. https://doi.org/10.1016/j.jphys.2021.12.012
- 17. Vaccination-info (2021). Tények a COVID-19-ről. <u>https://vaccination-info.eu/hu/COVID-19/tenyek-COVID-19-rol</u>
- Varga, JT., Madurka, I., Boros, E., Czibók, Cs., Kováts, Zs., Bogos, K., Müller, V. & Szilasi, M. (2021). COVID-19 betegek komplex rehabilitációja. Országos Korányi Pulmonológiai Intézet, Budapest; Országos Orvosi Rehabilitációs Intézet, Budapest; Semmelweis Egyetem, Pulmonológiai Klinika, Budapest.
- 19. Vályi, P. (2021). A fizikai aktivitás újrakezdése COVID-19-fertőzés után. Hypertonia és Nephrologia, 25(03)125-127.
- 20. WHO (2021). Support for Rehabilitation: Self-Management after COVID-19 Related Illness (2021) <u>https://www.who.int/publications/m/item/support-for-rehabilitation-self-management-after-COVID-19-related-illness</u>
- Zafar, H., Albarrati, A., Alghadir, AH. & Iqbal, ZA. (2018). Effect of Different Head-Neck Postures on the Respiratory Function in Healthy Males. Biomed Res Int, 12;2018:4518269. doi: 10.1155/2018/4518269