



Scientific contribution/Review

Digital Physiotherapy and COVID-19

Amon M^{1*}, Kresal F¹

¹ Institution of Higher Education FIZIOTERAPEVTIKA, Ljubljana, Slovenia

* Correspondence: Mojca Amon; amon.mojca@gmail.com

Abstract:

During the burning period of the coronavirus disease (COVID-19) pandemic, the need to provide remote health services has already increased. Today, the indefinitely defined state of long COVID-19 combines a complex of consequences after COVID-19, which is currently considered a long-term pathogenic mechanism after overcoming the disease, but it may not be wrong to predict that the consequences will increase the importance of physical activity and malnutrition of the health system, only remotely. Remote rehabilitation or telerehabilitation is an example of an emergency solution such as the COVID-19 pandemic. The results of research indicate the success of telerehabilitation of older adults of various diagnoses in tracking functional outcomes and satisfaction.

Citation: Amon M, Kresal F. Digital physiotherapy and COVID-19.

Proceedings of Socratic Lectures.

2021; 6: 72-75.

[https://doi.org/10.55295/PSL.2021.D.](https://doi.org/10.55295/PSL.2021.D.010)

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Keywords: Telemedicine; Telerehabilitation; Virtual physiotherapy; Telephysiotherapy; Exercise; Health prevention

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1. Introduction

Modern hybrid approaches to a combination of face-to-face and remote meetings (telephone, home visits, telerehabilitation visits) have shown positive results in terms of functional capacity, depression and overload reduction (Oh-Park et al., 2021). The results of individuals after humerus fracture, complete knee arthroplasty and after heart attack were evaluated as positive in telemedicine rehabilitation.

There is no direct evidence that physical activity can prevent or cure COVID-19, but promoting an active lifestyle is a key intervention to prevent health restrictions and the effects of social exclusion, especially in older adults and other at-risk individuals such as those living with chronic diseases. related to aging and lifestyle.

Since most COVID-19 patients are mostly associated with an associated disease, it is important that physical rehabilitation (physiotherapeutic kinesiotherapy) is performed by professionals such as physiotherapists (health workers).

2. Methods

The search strategy and the selection of the literature were carried out with the help of the PubMed, so that the MEDLINE database with the following combination of keywords was basically used: telemedicine; virtual reality; elderly; COVID-19. Although the search did not follow the guidelines of the systematic review article, the final database included articles younger than 10 years, telerehabilitation, which combined elements of the health impact of therapeutically oriented physical activity, and compared results across different physiological systems.

3. Results

3.1 *Physical inactivity and muscle dysfunction*

Indirect physical inactivity and its consequences, such as accumulation of adipose tissue and muscle dysfunction, can affect the flexibility of immunity. Given the recent emergence of COVID-19, future studies should examine whether physical activity is a protective factor to reduce the risk of complications caused by COVID-19 (Damiot et al., 2020).

3.2 *Fragility prevention*

Fragility is a geriatric syndrome that affects several domains of an individual's functioning. Various problems contribute to the development of fragility syndrome. Impaired nutritional status is an important determinant of fragility. Recent evidence on the link between nutritional status and fragility syndrome in older adults confirms the importance of both quantitative (energy intake) and qualitative (nutritional quality) dietary factors in the development of fragility syndrome in older adults (Lorenzo-Lopez et al., 2017). However, further research is needed on this topic to elucidate the mechanism of the potential role of diet in preventing, postponing, or even reversing fragility syndrome.

3.3 *Ageing control*

The aging process may be accompanied by an increased risk of functional limitations, disability and social disabilities, social isolation and dependence on the help of others. Strengthening health status with increasing longevity is essential and also a decisive factor in maintaining an individual's independence.

It is desirable that future proposals for health measures will focus on solutions to strengthen the physical capacity of the population, including neurocognitive stimulation (Kara et al., 2020), which can provide an example of long-term physiotherapy support and intergenerational integration through rehabilitation offer to maintain physical fitness and active lifestyle.



3.4 Immune function control

Over the years, the immune system changes and this affects the acquired and innate response of the immune system. Infections, cancers, and autoimmune diseases are more common in older adults, and a number of factors are responsible for this phenomenon (Fuentes et al., 2017). Age-related changes and the weakening of the innate and acquired immune systems play the greatest role.

When the immune system is weakened, there are changes in the immune response (Dugan et al., 2020), which can be increased, weakened or uncontrolled and leads to poorer outcomes in bacterial and viral infections or vaccine response. Immune system involvement is also described as restructuring of the immune system due to oxidative stress and is the result of an imbalance between inflammatory and anti-inflammatory mechanisms t.i. age-related inflammation.

Stable health status of older adults is not only the result of inflammatory mechanisms, but also the effectiveness of the entire system acquired over a lifetime. Combined with hormonal changes, nutritional deficiencies, and physical inactivity, the condition can lead to fragility or sarcopenia. The state of the immune system may play a central role in regulating the mechanisms of aging and the occurrence of age-related diseases (Oh et al., 2019). The immune system is also associated with the state of the endocrine, digestive, renal, respiratory-cardiovascular and neuromuscular and skeletal systems.

4. Discussion

An effective immune system typically adapts to changes in the environment (Nicholson, 2016). Chen et al. (2021) emphasize the need for research monitoring of older adults after Covid-19 vaccination for future understanding of the pathogenesis of the disease and its consequences (long Covid) and the development of appropriate measures. Partial or full social distance across much of the world has been introduced to control Covid-19 transmission.

Social isolation can lead to a decline in physical activity, which could lead to immune system dysfunction, increasing susceptibility to infections and exacerbating the pathophysiology of diseases common among older adults or vulnerable groups, including cardiovascular disease, cancer, and inflammatory disorders.

Older adults and people living with different comorbidities are at higher risk for complications during Covid-19 (Damiot et al., 2020). On the other hand, the literature indisputably describes in detail the many benefits of physical activity during the period of growth and adolescence, as the movement has exceptional educational and developmental potential (Škof et al., 2016). Researchers report the negative impact of physical inactivity on immune function, and we are showing evidence that regular physical activity can be an effective strategy to prevent some of the detrimental effects of social exclusion. Moreover, there is consensus that the way to reduce the rate of contamination and spread of SARS-CoV-2 via human-to-human transmission is social distancing. However, the practice of moderate-intensity exercise at home is recommended. Low-to-moderate exercise-induced immunomodulation might be an important tool to improve immune responses against the progression of Covid-19 infection (Leandro et al., 2020).

Additionally, malnutrition is common in the elderly and is a burden responsible for negative health-related outcomes. Nutritional status, which includes nutrition and hydration control, has been largely ignored in routine clinical physiotherapy practice since normal times. Patients at high risk for adverse clinical outcomes of COVID-19 infection are at risk of malnutrition in older adults and multimorbid individuals (Barazzoni et al., 2020).

Attention to this critical aspect for the health of the elderly is dramatically ignored in the acute care units overwhelmed by the COVID-19 emergency today, despite evidence of how malnutrition negatively affects patients' prognosis and recovery. In addition, sarcopenia is one of the most proven conditions for successful rehabilitation of the elderly. It is defined as a loss of muscle mass and strength that leads to impaired performance



(Cruz-Jentoft et al., 2014). Sarcopenia is closely associated with an impoverished diet and has been indicated as one of its clinical manifestations (Cederholm et al., 2019).

5. Conclusion

The biological benefits of regular physical activity are undeniable. Among the more interesting adaptive consequences of physical activity is the mechanism of exercise-induced immunomodulation, which can become a means of precautionary action as well as clinical treatment of COVID-19. The mechanism of exercise-induced immunomodulation has been known for more than 30 years and is presented in approximately 5,000 professional original and review articles available in Medline and the PubMed database. Exercise-induced immunomodulation depends on the interaction of external exercise factors such as exercise type, duration, and frequency of exercise. In the future, further studies of distance physical rehabilitation will be needed, especially in the elderly adult population.

Potential benefits of telerehabilitation in geriatrics represent improved accessibility of health services for adults with transport limitations; avoidable risks of communicable disease transmission (COVID-19 case), avoidable inconveniences, loss of time and transport costs. It is important to be aware of the disadvantages of telerehabilitation in geriatrics, which may relate to the requirement for a certain level of technological skill, the requirement for assistance to individuals with hearing, vision or cognitive impairments, the requirement for increased responsibility for reporting health and monitoring responses. Last but not least, the disadvantage of alternative remote access to health services in the form of telerehabilitation is also the absence of human contact and at the same time the patient's motivation at a distance can be limited.

Conflicts of Interest: The authors declare no conflict of interest.

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