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Rehabilitation in the treatment and management of people affected by post COVID-19 condition

A LITERATURE REVIEW

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<p>Abstract</p> <p>In December 2020 the World Health Organization (WHO) announced COVID-19 as a global health emergency and three months later the same organization announced COVID-19 as a global pandemic. From the amount of people affected by COVID-19 approximately 20% of them are suffering from post-covid-19 conditions various symptoms. In Finland over 100,000 people have become ill with covid-19 and one third of those people have symptoms that have lasted over three months. Even after these massive efforts to prevent, treat and diagnose COVID-19 we still have not exposed individuals lasting effects after acute phase. Evidence suggests that people can develop prolonged symptoms after mild or severe COVID-19 infection. The mechanism of the long-term symptoms is yet to be revealed.</p> <p>The objective of this thesis was to make a literature review from the latest information about the rehabilitation in treatment and management of post COVID-19 syndrome and have current information in a simple form. The last search for articles was conducted in September 2022. The database used in this thesis was PubMed and the articles used should not have been more than one year old. The articles should answer to the research question that the author of this thesis was trying to answer: what rehabilitation methods are used for post-covid-19 condition and are those methods effective in the treatment and rehabilitation for people suffering from post-covid 19 condition symptoms?</p> <p>Research shows that rehabilitation for post-covid-19-condition should include a combination of physical rehabilitation exercises and cognitive training. Rehabilitation should be done based on symptoms and it should be multidisciplinary. Based on the knowledge today, rehabilitation interventions could have positive effect on people suffering from post-covid-19 condition, but evidence points out that these people benefit greatly from multidisciplinary teamwork.</p>		
Keywords: post covid, long covid, post-acute covid, chronic covid, physical therapy, physiotherapy, exercise therapy rehabilitation, multidisciplinary		

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1 INTRODUCTION

In December 2020 the World Health Organization (WHO) announced COVID-19 as a global health emergency and three months later the same organization announced COVID-19 as a global pandemic (website of WHO, 2022). Since that time every professional working with these patients has tried to find different ways of helping them with their various symptoms with quickly done practical guidelines that are not evidence based (Yelin et al. 2022). According to Fugazzaro et.al (2022) discovered that from the amount of people affected by COVID-19 approximately 20% of them are suffering from post-covid-19 conditions various symptoms. Only in Finland over 100,000 people have become ill with covid-19 and one third of those people have symptoms that have lasted over three months (Käypähoito, 2022).

Taking into consideration the number of affected people by Covid-19 worldwide it would be highly recommended to do pedantic categorization for long covid-19 syndrome that will not only help the people who these effects on but pushes the research towards support and treatment which will in the long run help us to be more prepared to response the aftermath that COVID-19 pandemic will leave us (Michelen et al. 2021).

Rehabilitation for post-covid 19 condition is based on symptoms and it should be multidisciplinary. The aim for rehabilitation is to prevent general condition from worsening and keep the condition from being chronic. (Fysioterapia, 52-54,2022)

The motivation for this subject was that thesis about this matter has not yet been done before and it is a big part of our current everyday life from 2019. As a future physiotherapist, reflection of this situation is in order because of the aftermath of this pandemic is surely coming in some form in my opinion. The whole world was closed because of this, but repercussion from that is subject for different thesis. This thesis is narrowed only to post- covid condition and what type of rehabilitation methods are

recommended based on the current knowledge and how can we help people dealing with the most common symptoms. One of the core competences of physiotherapist is guiding and counseling (Suomen fysioterapeutit, 2022), as for now this condition can be relevant to have information about for the years coming.

2 AIM AND OBJECTIVES

The aim of this thesis is to spread knowledge of long covid and its possible need of physiotherapy in rehabilitation and management. The objective for this thesis was to make a literature review from the latest information about the rehabilitation in treatment and management of post COVID-19 syndrome and have current information in a simple form in everyone's reach.

3 POST COVID-19 CONDITION

In China 2019 severe acute respiratory syndrome coronavirus (SARS-CoV-2) was detected known later as COVID-19. After that world widely over 522 million people have been infected and more than 6 million have died from COVID-19 by May 2022. Massive efforts were made which included for example lockdown, quarantine and social distancing that were made to contain virus from spreading (Houben S. & Bonnec re 2022.) Even after these efforts of medical and scientific community to prevent, treat and diagnose COVID-19, we still have not exposed individuals lasting effects after acute phase (Lopez-Leon et al.2021.) Post- covid 19 affects both types of people; those who have been hospitalized and those who managed in community setting. Evidence suggests that people can develop prolonged symptoms after mild or severe COVID-19 infection. (Physiopedia, 2022.) COVID-19 is known for its

capability of causing tissue and organ damage, vascular changes and thrombosis. The mechanism of the long-term symptoms is yet to be revealed, but in addition to organ damages it might include characteristics of chronic inflammation, autoimmune reactions where defense system activates making body to attack against its own tissues. COVID-19 virus also disturbs autonomic nervous system which regulates our body functions (Käypähoito, 2022.)

3.1 Pathological process

Because the detailed information about the long-term persistence of symptoms is lacking due to the crescent of COVID-19 meaning that there is not agreed definition for “long covid”. French National Authority for Health and British National Institute for Health and Care Excellence (NICE) have their own definition scale how they define post-covid-19-syndrome based on 4-12 weeks after the onset of symptoms when one or more initial symptom is persistence and cannot be explained any other cause. The World Health Organization (WHO) defines post-covid-19-condition by having symptoms for at least for two months without any other explanation for having them after confirmed or probable acute COVID-19 infection. (Nguyen N., et al. 2022.) Post-covid-19 syndrome is diagnosed by basically ruling out all other possible explaining factors for those symptoms. (Fysioterapia,2, 52-54, 2022).

Post-covid-19 syndrome is at this moment defined as a condition that is characterized by long term complications and/or persistent symptoms that are delayed more than four (4) weeks after onset of COVID-19 acute infection. Post-covid syndrome can be subdivided into two categories which are subacute or ongoing symptomatic COVID-19 that means that a person is still symptomatic or has abnormalities for 4-12 weeks after the acute COVID-19 infection and chronic or post-covid-19 syndrome that means that a person is still symptomatic or has abnormalities for 12 weeks after the onset of acute COVID-19 infection. (Fugazzo S., et al. 2022.)

3.2 Prevalence

Even though we have a lot of information about this disease we still have huge gaps in our knowledge including the factual risk factors, but also regarding pathogenesis, actual incidence, diagnosis, management and long-term outcomes of post-covid-19 syndrome. Of the recovering patients 22% - 40% are expected to have symptoms of post covid-19 syndrome (Yelin D., et al. 2022.) 20% or more from the amount of people affected by COVID-19 undergo one or more symptoms of post covid-19-syndrome and almost 50% of patients discovered either deterioration or limitations in their everyday life or quality of life (QoL) six months after hospital discharge, most commonly reported problems are low performance in activities of daily living (ADL) (35%), discomfort or pain (33%) or reduced mobility (33%) according to Fugazzaro S., et al (2022). In Finland 1,348,737 million people have been infected by COVID-19 (Koronatilastot, 2022) and one third of those experience continues symptoms that lasts over three months. (Käypähoito, 2022) After acute COVID-19 infection nearly 50% of people can have one or more symptoms six months after onset. (Fysioterapia, 2, 52-54. 2022).

3.3 Risk factors

Nguyen N., et al. (2022) investigated risk factors from studies and they came to conclusion that persistence of overall symptoms was related with being older female with high BMI, number of comorbidities and respiratory disease and symptoms during the acute phase of COVID-19. According to some studies women were more likely to experience post-covid-19 syndrome than men (OR: 1,268; 95% CI: 1,122-1,432; P=0.0001). Present with respiratory problems at the onset of infection was also associated with post-covid 19- syndrome (OR: 1.425; 95% CI: 1.177-1.724; P=0.0001) (Asadi-Pooya, A. A., et al. 2021.) Based on FINCOVID-19 research that have been done in collaboration with Helsinki University Hospital (HUS) and RECOVID-project, men seem to recover better than women from COVID-19 that needed hospitalization. (Fysioterapia, 2, 2022)

3.4 Symptoms of post covid-19 condition

Post- covid 19 is known for its surging character. (Fysioterapia, 52-54, 2022) post-covid-19 is known to have wide range of physical and neuropsychological symptoms that include impacts on psychological wellbeing cognition and mental health, but the intervention research has only started to emerge (Hawke L. D., et al. 2022). According to the RCTs study design done by Fugazzaro S., et al (2022) the five most common symptoms are fatigue (58%), headache (44%), attention disorder (27%), alopecia (25%) and dyspnea (24%), but other continuous and diversity symptoms were reported such as chest pain, cough, memory loss, "brain fog", smell and taste dysfunction, Post traumatic stress disorder- symptoms (PTSD), sleep disorders, anxiety, depression, rashes, gastrointestinal upset, palpitations and musculoskeletal problems, including impaired mobility and joint pain. Nearly 10% of people affected by acute COVID-19 will suffer from musculoskeletal post-covid 19 pain symptomatology during the first year after the infection. Early recognition of symptoms would benefit symptomatic people to get immediate help and interventions that they need for their symptoms. (Fernandez De Las Penas, C., et al 2021.) When talking about worsening of symptoms or extensive fatigue we can talk about post-exertional-malaise-symptom (PEM). PEM-symptom is when the slightest strain (cognitive, physical, social or emotional) can cause vigorous condition deterioration straight after event or even 24 hours after. Activities of daily living (ADL) that were normally tolerated well, can now cause tremendous strain to people suffering from post-covid-19 condition. (Fysioterapia, 52-54, 2022.) 57% of the people suffering from persisting symptoms over 12 weeks had reported that their quality of life (QoL) had decreased, and the symptoms greatly affect their quality of life and returning to daily activities (ADL) and work. (Yelin, D., et al 2022) Despite their symptoms people still tend to return to their work and continue their normal everyday life. (Fysioterapia, 52-54, 2022)

4 REHABILITATION FOR POST COVID-19 CONDITION

Different health care systems are challenged, and the COVID-19 pandemic has irreparably changed the organization of our society. Rehabilitation specialists are now facing the challenge of managing the long-term complications of post-covid 19 and even though it seems that these symptoms diminish with time it is crucial to create strategies to enhance the situation. There has been some work done for rehabilitation for cognitive functions, yet evidence points out that the best option is a combination of physical rehabilitation exercises and cognitive training (Houben, S., & Bonnechère, B., 2022.) Rehabilitation should be done based on symptoms and it should be multidisciplinary. (Fysioterapia, 52-54, 2022) Research shows that exercise rehabilitation could have notable effect on the healing process of patients affected by post-covid-19 (Besnier F., et al. 2022). Improvement could be seen with aerobic training, strength exercises, diaphragmatic breathing techniques and mindfulness training with post-covid 19 patients after certain period, but more larger studies need to be done. (Yoli, J., et al 2022) Immobilization even a short period of time, in-hospital or at home, bed rest and the inactivity of sustained quarantine can have clinically relevant effects on muscle and metabolic health. As short as 2 weeks of reduction in physical activity can result in significant losses in muscle mass and function and peripheral insulin sensitivity. (Morrow, A., et al. 2022.) Pulmonary rehabilitation could have improved effect in exercise capacity. (Chen, H., et al, 2022) Based on the evidence rehabilitation is good to start rehabilitation gradually and monitoring persons own wellbeing, e.g with pacing. It is also beneficial to consider pervasively psychological, physical and social functional abilities which can be assessed with International Classification of Functioning (ICF)- classification. (Fysioterapia, 52-54, 2022.)

4.1 Multidisciplinary teamwork

Studies have shown that multi-disciplinary teamwork is the most effective approach for post- covid condition (Lopez-Leon, et al, 2021). Post- covid- 19 condition is multifactorial disease meaning that most patients benefit from multi professional teamwork. Physiotherapist can give help for the physical symptoms of post-covid 19. (Käypähoito, 2022.) Research shows that physiotherapy methods may help in the rehabilitation process of post covid-19 condition. More research should be done in the future to be sure that physical therapy influences the condition. Multidisciplinary teamwork seems to be the most effective approach to post covid-19 condition. (Fysioterapia, 52-54, 2022.)

4.2 Outcome measures

“Clinical outcome measures become more important when there is little or no evidence from high quality randomized trials.” (Herbert, R., et al. 2005) Besnier, F., et al. (2022) used several outcome measures to see if interventions have any effect on tested persons. Tests were: 6-minute walking test: sub-maximal exercise test that is usually used to assess aerobic capacity in elderly adults; adults walk on 30m walkway to cover highest walking distance in 6 minutes time. Spirometry measurements: included the forced expiratory volume 1 s (FEV1), the forced vital capacity (FVC) (maximal amount of air forced out of the lungs after full inspiration), vital capacity (VC) (maximum amount of air that can be exhaled from the lungs when blowing out as quickly as possible), the peak expiratory flow (PEF) (maximal flow blowing out steady rate) and the inspiratory vital capacity (IVC) (maximal amount of air inhaled after full expiration). TUG-test (timed up & go): participant gets up from chair, walks three meters, turns around, sits back in the chair and the performance is recorded. 5-STST (five stand-ups and sit-downs in a row as quickly as possible): performed as quickly as possible, to assess functional and respiratory ability. Yelin et al. (2022) used SPPB – Short performance physical battery as one outcome measure that included balance assessment in standing position, standing up from a chair with five repetitions and

walking speed for 4 minutes and sit to stand- test that measures the repetitions done in certain time (15-30 seconds) to be done before and after rehabilitation program to assess possible progress yet there was no clear evidence for or against of using these for assessment of rehabilitation.

4.3 Telerehabilitation

Because of the prevention of new infections healthcare professionals needed to practice “social distancing” which reduced dramatically face-to-face meeting with health care professionals and other procedures the system needed to adapt and started to assess and treat people remotely. (Viera, A., et al 2022.) This could be provided through various digital channels such as video/audio calls, recorded videos, text messages, emails, links to educational materials. (Houben, S., & Bonnechère, B., 2022) Telerehabilitation was recommended to physiotherapists to treat and assess people remotely. Telerehabilitation had some positive affect on some of the post-covid- 19 patients which were measured with 30-second sit-to-stand test and 6- minute walking- test. Functional capacity, physical components of quality of life, dyspnoea and performance may improve with telerehabilitation. (Viera, A., et al 2022.)

4.4 Self-monitoring

Monitoring of own symptoms is very important. Scales for self-monitoring should be chosen according to the person's needs. Monitoring one's own well-being should not cause more stress or anxiety. Self-monitoring can give the person an understanding of their own resources and knowing how to regulate and manage those resources in their everyday life and ADL-activities with post-covid-19 condition. (Fysioterapia, 52-54, 2022.)

5 THESIS PROCESS AND METHODS

As said in aims and objectives that this thesis provides a literature review of rehabilitation for post-covid 19- syndrome. A literature review provides an overview of current information, which allows you to identify relevant theories, methods, and gaps in present research. (Scribbr, 2022) A literature review is mixed method of qualitative and quantitative research methods based on more on the qualitative synthesis. Below you will find the thesis process explained more thoroughly.

5.1 Obtaining information

Information search for this thesis was done with SAMK information specialist Teppo Hjelt in spring 2022. The database chosen for the literature search was PubMed. Articles searched were not to be older than one year (2021–2022) and only systematic reviews, randomized control trials (RCT) and meta-analyze- articles were included into this thesis and should answer to the question that this thesis was trying to discover: what rehabilitation methods are used for post-covid-19 condition and are those methods effective in the treatment and rehabilitation for people suffering from post-covid 19 condition symptoms? Eligible criteria for the participants or studies included should be seen on the studies and there should be seen outcome measures that evaluates done interventions.

The last search for articles was conducted in September 2022. Search was made with ("post covid"[tiab] OR "long covid"[tiab] OR "post-acute covid"[tiab] OR "chronic covid"[tiab]) AND ("physical therapy"[tiab] OR physiotherapy[tiab] OR "exercise therapy"[tiab] OR rehabilitation[tiab] OR multidisciplinary[tiab]). This search gave 27 articles for the author. 8 articles were included for this thesis. Below can be seen the exclusion process in table 1. and manual search articles in table 2.

Table 1. The search words and the exclusion process

Database	Search words	Exclusion number and criteria	Article count
PubMed	("post covid"[tiab] OR "long covid"[tiab] OR "post-acute covid"[tiab] OR "chronic covid"[tiab]) AND ("physical therapy"[tiab] OR physiotherapy[tiab] OR "exercise therapy"[tiab] OR rehabilitation[tiab] OR multidisciplinary[tiab])		27
		4 excluded based on abstract	23
		9 excluded based on heading	14
		6 excluded based on text	8 INCLUDED

Table 2. The articles of complementary manual search.

Search method	Article name	Authors
Complementary manual search	Pitkäkestoisen COVID-19 oirekuva on yksilöllinen: samoin sen kuntoutus.	Fysioterapia (2), 52-54. 2022.

Inclusion criteria was that the articles answered the objective of this thesis which was to have the latest overview of information of rehabilitation for post-covid-19 condition and what are those tools that can be used to help people with their rehabilitation. Most of the articles included were trying to answer if certain rehabilitation methods are useful and what outcome measures, they used to find out if the rehabilitation methods used were useful. One article used in this thesis was in respected journal for finnish physiotherapists in summer 2022.

Articles were meant to be evaluated with Physiotherapy Evidence Database (PEDro) scale which scores articles. The PEDro scale was done to help rapidly identify trials that are likely to be internally valid and have sufficient statistical information to guide clinical decision-making. Each report gives PEDro score to trials. Total PEDro scores of 0-3 are considered 'poor', 4-5 'fair', 6-8 'good', and 9-10 'excellent', it is important to note that these classifications have not been validated. Total PEDro score of 8/10 is optimal. (Website of Physiotherapy Evidence Database, 2022.) As the author tried to evaluate the articles it became clear that most of the articles in question were not eligible for this evaluation scaling or the author did not know how to use PEDro scale properly and most of the studies had more than one rehabilitation method that was measured to be seen if the interventions were valid for the rehabilitation of post-covid-19-condition.

5.2 Schedule

The topic of this thesis was chosen in spring 2020 by the author. Thesis topic was presented for acceptance for tutor teacher Mari Törne autumn 2021 and the plan presented in spring 2022. During the summer of 2022 thesis project started and search was made couple of times in PubMed. At that time search was giving lot articles, but number of articles had decreased by the last search in September 2022 and after last search started writing the thesis based on the knowledge of the last articles given by PubMed. In October 2022 thesis was presented to the thesis tutor and the final version was submitted in late October and presented in November 2022.

Thesis process proceeded to have an answer for objective of this thesis that is discussed beginning of this thesis. Thesis topic was accepted in autumn 2021 and then the information obtaining started in spring 2022 and ended summer 2022. With the search words author was given 27 articles which from 4 articles was excluded based on abstract, 9 articles were excluded based on heading and 6 were excluded based on text. Giving the author a total of 8 articles. The writing process was done during autumn 2022. Presentation of thesis was done beginning of November.

6 DISCUSSION

This thesis provides the epidemiology of post-covid condition and the most recent information for rehabilitation and management of this condition and answers the following questions: Can we as health care professionals help patients with post-covid condition and how can we accomplish that? For now, it seems that the most effective approach for post-covid-19 is multidisciplinary teamwork and treatment based on symptoms.

Pandemic is currently going on and maybe in a couple of years post COVID-19 condition will have more information in general of how these patients should be treated or they are totally forgotten. Information and facts about the rehabilitation of post COVID-19 condition are more assumptions of what is supposed to do in rehabilitation, and potentially in future physiotherapy could be more used in the post covid- 19 condition rehabilitation. This thesis is for now the first thesis on this subject and hopefully it will not be the last one. It is important to understand physiotherapist's role in the rehabilitation of post-covid-19 condition if someone comes for help with this condition even though benefits of physiotherapy based on the knowledge that we have now for long covid are still in need of more research.

Soon as this process started it became clear that this is a bigger subject, and it would have needed much more effort what author could give for it. Articles had very little knowledge if physiotherapy other than respiratory physiotherapy is useful but perhaps

later in the future when there comes more information about the treatments and outcomes of those treatments it will enlighten the rehabilitation path. But we're on the right path to find out the best way to help and analyze our rehabilitation interventions outcome or do we just need to come to conclusion that there is no proper treatment and waiting for the symptoms to cave in is one option. Multidisciplinary teamwork seems to be the strongest approach to post-covid-19 syndrome for the time being. More research is required when we talk about other rehabilitation methods. The findings in the articles were not all positive, but they were not completely negative either. It was very stressful to find articles that answered thesis questions and had evidence-based information. This thesis had good intention to have the latest knowledge, but as the thesis journey proceeded it seemed that every article differs a little from each other. This subject is very relevant and yet there is not that much concrete information, and it leaves this thesis feeling a bit unfinished for the author, but it leaves door open for the next student to update or do over this information. Only the most recent articles were included in this thesis and the highest value research methods that would give possible high-class evidence on this point.

The hardest part in this thesis was knowing that there is not yet proper rehabilitation for this condition even though so many people seem to suffer from this. The idea of this thesis was to give an overview of the evidence-based knowledge of the rehabilitation in post-covid-19 syndrome. In a perfect world there would have been done precise research and proper analysis of those articles, but now only basics were done by the author. It would have been great to find lot of articles including how physiotherapy can help with symptoms, but all that was found was assumptions of rehabilitation in general how it could help and almost every article was in desperate need of more information to have solid information that could be in use helping these people.

Next student who wants to continue this subject can update the newest knowledge and analyze how has the current hypothesis helped affected people and do more systematized literature review of this subject, because there is lot of studies made of this subject, but how many of those provide actual new approach or knowledge for the treatment and rehabilitation is different story. When more time has passed a questionnaire could be done for people who have been affected by COVID-19, and

have they had any help with their symptoms and if they have what did they benefit from. There could be also done thesis about those people who needed hospitalization versus those who had post-covid-19 syndrome symptoms 4-12 weeks after acute phase but did not need medical attention because this thesis consists only the overall information of long covid-19 and what rehabilitation methods could be used to help, and this could be divided to those who have had hospital care and those who have been cared at home. The author is also looking forward to what kind of information Helsinki University Hospital with their ongoing research of post- covid-19 condition.

When this thesis subject was chosen it was clear that this subject is what needed to have a closer look to have understanding and once more go through these two years when worldwide we have been in lockdowns and quarantines because of COVID-19. There must be an aftermath for all of this like loneliness, deterioration of activity of daily life or quality of life etc. This subject should have more time put into it than was given for this thesis. Surprising was how little knowledge there is at this moment even though the amount of people that have gone through of this or are coping daily as we speak. The ultimate question is whether you can get proper help if you have post-covid-19 syndrome symptoms or is this something that will pass and years after this no one remembers these two years. As this thesis process is coming to its end the world is starting to continue life as it was before the pandemic but are there resources to make sure that those people affected by these two years can get the help they need?

After this thesis project authors personal knowledge of this condition is greater than ever and this thesis project provided knowledge that can be used in the field of rehabilitation. Awareness of these symptoms is better and rehabilitation methods and outcomes measures are familiar.

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APPENDIX 1