


Early experiences of rehabilitation for individuals post-COVID to improve fatigue, breathlessness exercise capacity and cognition – A cohort study

Enya Daynes^{1,2}, Charlotte Gerlis¹, Emma Chaplin¹,
Nikki Gardiner¹ and Sally J Singh^{1,2}

Chronic Respiratory Disease
Volume 18: 1–4
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/14799731211015691
journals.sagepub.com/home/crd


Abstract

Individuals with lasting symptoms of COVID-19 should be offered a comprehensive recovery programme. 30 individuals (mean[SD] age 58[16]) that completed a 6 week, twice supervised rehabilitation programme demonstrated statistically significant improvements in exercise capacity, respiratory symptoms, fatigue and cognition. Participants improved by 112 m on the Incremental Shuttle Walking Test and 544 seconds on the Endurance Shuttle Walking Test. There were no serious adverse events recorded, and there were no dropouts related to symptom worsening. COVID-19 rehabilitation appears feasible and significantly improves clinical outcomes.

Keywords

COVID, rehabilitation, breathlessness, fatigue, exercise

Date received: 12 March 2021; accepted: 14 April 2021

Introduction

COVID-19 can lead to a number of lasting symptoms such as breathlessness, fatigue and reduced ability to engage in activities of daily living.¹ It became apparent that a recovery or rehabilitation programme would be necessary to support those to return to normal following infection. The European Respiratory Society taskforce identified a need for a formal assessment to understand physical and emotional functioning to determine rehabilitation needs following COVID-19 infection.² This statement identifies the need for a rehabilitative intervention following hospital discharge and includes a comprehensive programme. It has been acknowledged that a unidimensional programme will not meet the needs of COVID-19 survivors who will present with a variety of different symptoms.³ However, there is invariably some

overlap between the needs of COVID-19 survivors and a Pulmonary Rehabilitation (PR) population. PR is a highly evidenced based intervention and addresses many symptoms reported in those suffering

¹ Centre of Exercise and Rehabilitation Sciences, NIHR Leicester Biomedical Research Centre - Respiratory, University Hospitals of Leicester, Leicester, UK

² Department of Respiratory Sciences, University of Leicester, Leicester, UK

Corresponding author:

Enya Daynes, Centre of Exercise and Rehabilitation Sciences, NIHR Leicester Biomedical Research Centre-Respiratory, University Hospitals of Leicester, Leicester LE3 9QP, UK; Department of Respiratory Sciences, University of Leicester, Leicester, UK.
Email: enya.daynes@uhl-tr.nhs.uk



from long-COVID (symptoms lasting ≥ 3 months post infection), such as breathlessness, low energy, ability to perform daily tasks, sleep disturbance and confidence⁴; but it will likely need modifications. Therefore this model was adapted when developing COVID-19 rehabilitation to meet the complex needs of these individuals.² This study presents the results of the initial COVID-19 rehabilitation programme using exercise and education.

Methods

This study reports the experiences of the first 32 individuals that completed rehabilitation following COVID-19 infection. This observational study was approved by the National Health Service Research Ethics Committee (reference 17/EM/0156) and registered through the ISRCTN (ISRCTN45695543). Individuals were referred through a discharge follow up pathway; at COVID-19 medical follow up or; a referral from their GP. Individuals were included if they self-identified rehabilitation needs, whereby they displayed physical and/or psychological symptoms that were affecting their daily activities. Individuals were excluded if they demonstrated acute symptoms or were not medically stable or had only symptoms that were deemed not modifiable from a rehabilitation programme (i.e. loss of taste only). Individuals that had COVID-19 but managed in the community were eligible for the programme and were referred by their GP. All individuals were screened for unexplained symptoms and unstable cardiovascular disease.

The rehabilitation programme was 6 weeks in duration, with two supervised sessions per week. The programme comprised of aerobic exercise (walking/treadmill based), strength training of upper and lower limbs and educational discussions with handouts from the www.yourcovidrecovery.nhs.uk website. The education sessions included: breathlessness, cough, fatigue, fear and anxiety, memory and concentration, taste and smell, eating well, getting moving again, sleeping well, managing daily activities and, returning to work. Pacing advice was provided and reinforced alongside the exercise component. The Borg breathlessness scale and rate of perceived exertion were used alongside self-reported symptoms (including fatigue) to determine progression of the exercises. The outcomes were: the incremental and endurance shuttle walking test (ISWT/ESWT), COPD Assessment Test (CAT),⁴ Functional Assessment of Chronic Illness Therapy Fatigue Scale (FACIT), Hospital

Anxiety and Depression Scale (HADS), EuroQual 5 domains (EQ5D) and the Montreal Cognitive Assessment (MoCA). The ISWT and ESWT were completed in line with gold standards on a 10 m course and performed a familiarisation test at baseline.⁵

Data was analysed using SPSS v25. Individuals were considered completers if they attended 8 out of 12 scheduled sessions. A paired t-test was used to compare changes before and after rehabilitation.

Results

30 individuals completed the COVID-19 rehabilitation programme (52% male, mean [SD] age 58[16] years). 26 (87%) individuals were admitted to hospital with a mean[SD] length of stay 10[14] days, and 5 (14%) individuals required mechanical ventilation during their admission and were managed in an ITU setting. 4(13%) individuals had a pre-existing respiratory condition (n = 3 asthma, n = 1 COPD). The mean[SD] time from confirmed infection to enrolment onto the programme was 125[54] days. The mean[SD] number of sessions completed was 11[1] out of a scheduled 12 sessions. 30 individuals completed at least eight sessions of rehabilitation, with two drop outs due to social circumstances.

Baseline scores identified reduced exercise capacity and health related quality of life compared to healthy controls but relatively well preserved anxiety, depression and cognition as measured by the HADS and MoCA respectively.^{6,7} The mean[SD] SpO₂ at baseline was 96.3[1.2] and resting heart rate 80.9[12.2]. Individuals that completed rehabilitation had a mean [SD] within group improvement in the ISWT of 112[105]m ($p < 0.01$), and 544[377] seconds ($p < 0.01$). The FACIT improved by 5[7] points ($p < 0.01$), the EQ5D thermometer improved by 8[19] ($p = 0.05$) and MoCA by 2[2] points ($p < 0.01$) The CAT score improved by a score of 3[6] ($p < 0.05$). The HADS anxiety and depression scores improved by 0[4] and 1[4] respectively which was not statistically significant, however the baseline scores were low (Table 1). Figure 1 demonstrates the changes in FACIT and ISWT.

Discussion

This adapted rehabilitation programme for individuals following COVID-19 has demonstrated feasibility and promising improvements in clinical outcomes. There was a high completion rate of COVID rehabilitation in the first 32 individuals as demonstrated by

Table 1. Clinical outcomes pre and post-COVID rehabilitation.

N = 30	Pre rehabilitation	Post rehabilitation	Change	P =
ISWT (m)	300[198]	413[229]	112[105]	<0.01
ESWT (seconds)	292[260]	837[406]	544[377]	<0.01
CAT	16[7]	13[7]	-3[6]	<0.05
FACIT	29[14]	34[13]	5[7]	<0.01
EQ5D Thermometer	62[18]	70[21]	8[19]	0.05
MoCA	25[3]	27[3]	2[2]	<0.01
HADS A	6[4]	6[5]	0[4]	0.5
HADS D	6[4]	5[4]	-1[4]	0.1

Mean[SD] of clinical outcomes pre and post-COVID rehabilitation. ISWT Incremental Shuttle Walking Test, ESWT Endurance Shuttle Walking Test, CAT COPD Assessment Test, FACIT Functional Assessment of Chronic Illness Therapy (fatigue score), EQ5D EuroQual 5 Domain, MoCA Montreal Cognitive Assessment, HADS Hospital Anxiety and Depression Scale (A Anxiety and D Depression domain).

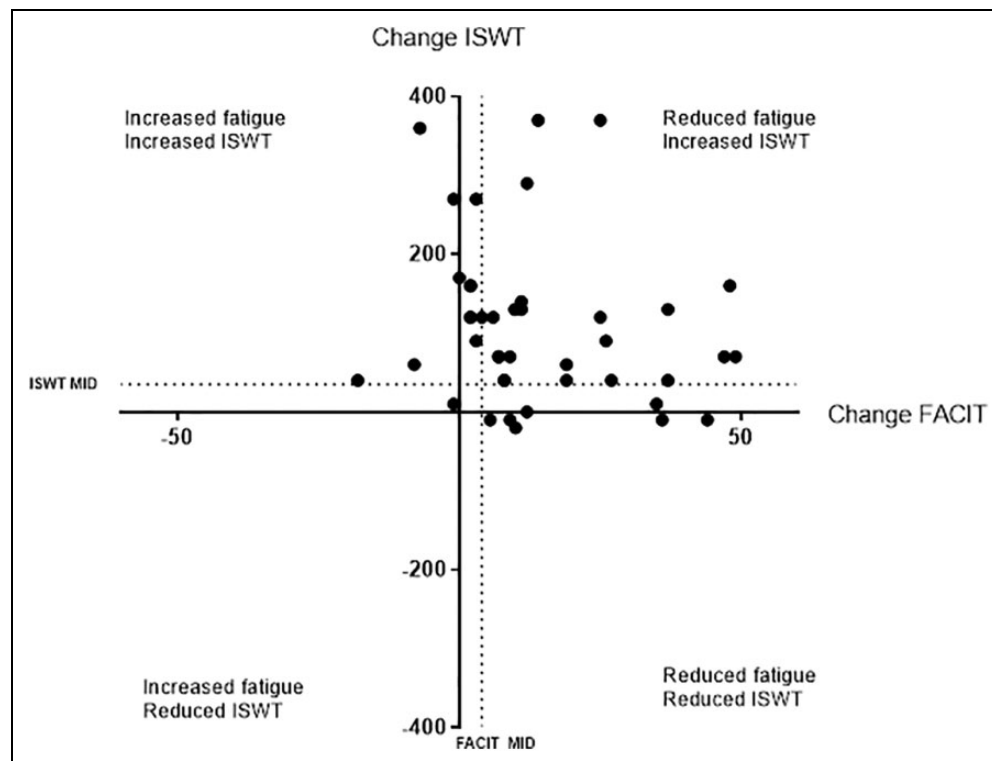


Figure 1. Changes in Fatigue and Incremental Shuttle Walking Test for individuals completing a COVID-19 rehabilitation programme..

this study, with no dropouts attributed to a worsening of symptoms, indicating acceptability to the participants of the intervention. There were significant improvements in clinical outcomes of walking capacity and symptoms of fatigue, cognition and respiratory symptoms (measured by the CAT). Whilst there are no known minimal important differences for these outcomes in individuals with COVID-19; the ISWT, ESWT, CAT, FACIT and, MoCA all exceed the known minimal important

differences in individuals undergoing conventional pulmonary rehabilitation, or with a chronic respiratory condition. It is possible that there is some natural recovery in this cohort of individuals, however, as the mean length of time between infection and enrolment onto the programme was 125 days it is likely that natural recovery had slowed down. This cohort is believed to be generalisable to individuals suffering with long-COVID who identify limiting symptoms, though this sample size is small and there is no

comparator group. This study includes both individuals post discharge and who were managed solely in the community.

There has been concern that rehabilitation may worsen or trigger symptoms of post-viral fatigue and that exercise therapy may exacerbate fatigue. The exercise element of this programme is progressed (by staff experienced in delivering pulmonary and cardiac rehabilitation programmes) in line with patient's symptoms throughout the programme and provides a holistic and pragmatic approach to exercise therapy. The educational component of the programme supports management techniques useful for these symptoms (such as pacing and prioritising). There were no serious adverse events during the course of the programme supporting the safety of this intervention. The majority of individuals improved both the symptom of fatigue and exercise capacity. One patient did not improve either fatigue or exercise capacity (due to a previous stroke). The remainder ($n = 4$) who reported an increase in fatigue recorded meaningful improvements in their exercise capacity. COVID-19.

Rehabilitation programmes should aim to provide a holistic and multi-faceted approach to managing post-COVID symptoms. Clinicians should aim to individualise programmes and to monitor adverse events and symptoms, given the limited evidence in the field.

To conclude, a rehabilitation programme to support individuals with symptoms of long-COVID is safe and demonstrates improvements in exercise capacity and symptoms of breathlessness, fatigue and cognition.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of

this article: This study was supported by the National Institute for Health Research (NIHR). The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.

ORCID iD

Enya Daynes  <https://orcid.org/0000-0003-0127-1649>

Supplemental material

Supplemental material for this article is available online.

References

1. Cortinovis N, Perico N and Remuzzi G. Long-term follow-up of recovered individuals with COVID-19. *Lancet* 2021; 397(10270): 173–175.
2. Spruit M, Holland A, Singh S, et al. COVID-19: interim guidance on rehabilitation in the hospital and post-hospital phase from a European Respiratory Society and American Thoracic Society-coordination international task force. *ERJ* 2020; 56(6): 2002197.
3. British Thoracic Society. Delivering rehabilitation to individuals surviving COVID-19 using an adapted pulmonary rehabilitation approach – BTS guidance. [Online]. www.brit-thoracic.org.uk (2020, accessed 8 February 2021).
4. Daynes E, Gerlis C, Briggs-Price S, et al. COPD assessment test for the evaluation of COVID-19 symptoms. *Thorax* 2020; 0(1–3).
5. Holland A, Spruit M, Troosters T, et al. An official European respiratory society/American thoracic society technical standard: field walking tests in chronic respiratory disease. *ERJ* 2014; 44: 1428–1446.
6. Harrison S, Greening N, Houchen-Wolloff L, et al. Age-specific normal values for the incremental shuttle walk test in a healthy British population. *J Cardiopulm Rehabil Prev* 2013; 33(5): 309–313.
7. Raghavan N, Lam Y, Webb K, et al. Components of the COPD Assessment Test (CAT) associated with a diagnosis of COPD in a random population sample. *COPD* 2012; 9: 175–183.