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Case Report

Treatment of Post-COVID and Chronic Fatigue Syndrome with a Proprioception Based Treatment

Betker JA[1,2]*, Peters K[3], Hinterberger T[1] and Loew T[1,3]

[1]Department for Psychosomatic Medicine, University Hospital Regensburg, Germany

[2]Department for Trauma Surgery, University Hospital Regensburg, Germany

[3]Department of Psychosomatic Medicine and Psychotherapy, Caritas-Krankenhaus Donaustauf, Germany

***Corresponding author:** Betker JA, Department for Psychosomatic Medicine, University Hospital Regensburg, Franz-Josef-Strauß-Allee 11, 93053, Germany

Email: Johann.Betker@klinik.uni-regensburg.de

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Abstract

Introduction: Post-COVID (PCS) syndrome manifests with profound fatigue, cognitive impairment, pain, myalgias, dizziness, shortness of breath and depression. Therapeutic options remain limited and the condition is often considered refractory.

Case Series: We describe nine patients with severe PCS and chronic fatigue syndrome (CFS) treated with a structured, multimodal inpatient program emphasizing sophisticated pacing for a median treatment duration of 116 days. The program is based on psychosomatic treatment principles, particularly those applied in conditions affecting body image, and has been specifically adapted by incorporating pacing to address profound fatigue. Daily activity was titrated to individual tolerance, beginning with brief exertion followed by rest and gradually increasing. Medical management was individualized and included supplementation, antidepressants, antipsychotics, and in selected cases nicotine patches or low-dose naloxone. Clinically meaningful improvements were observed across nearly all domains of Health-49 and ICD-10-based symptom rating (ISR). The largest gains occurred in somatoform complaints, with median scores decreasing from 2.50 to 1.43 in Health-49 and from 1.06 to 0.55 in ISR. Additional improvements were noted in activity, self-efficacy, and anxiety. Four patients remained wheelchair-dependent at discharge.

Discussion: The constellation of symptoms including chronic pain, myalgias, dizziness, and sensory hypersensitivity suggests that proprioceptive dysfunction may contribute to PCS and CFS. The selective improvement in somatoform domains following a psychosomatic, body-oriented intervention provides preliminary support for this hypothesis. Although limited by sample size, these findings indicate that post-COVID chronic fatigue syndrome may not be inherently untreatable and highlight somatosensory processing as a potential target for novel therapeutic strategies.

Keywords Post-COVID; Chronic fatigue syndrome; Proprioception; Body image; Quality of Life

Abbreviations

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; PCS: Post-COVID Syndrome; CFS: Chronic Fatigue Syndrome; POTS: Postural Orthostatic Tachycardia Syndrome; HRQoL: Health-Related Quality of Life; ISR: ICD-10-based Symptom Rating.

Introduction

Acute infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) exhibits a broad clinical spectrum, from mild illness to critical disease requiring invasive mechanical ventilation [1–3]. Although the majority of patients achieve full recovery, a considerable subset develops persistent or novel symptoms following the resolution of the acute phase [4]. Symptoms that persist or appear beyond four weeks post-infection are classified as post-COVID syndrome (PCS) [5,6].

To date, the most frequently reported symptoms include fatigue, cognitive impairments, sleep disturbances, myalgias, headaches and limb pain, shortness of breath, musculoskeletal complain, cognitive impairments, as well as depression [5,7–13].

In fact, chronic fatigue syndrome (CFS) has been identified in PCS with a prevalence of up to 45.2% [7]. Fatigue in this context is frequently associated with dysautonomia, most commonly manifesting as postural orthostatic tachycardia syndrome (POTS), characterized by dizziness, lightheadedness, and orthostatic tachycardia on standing [14–16].

In the following sections, we aim to introduce our treatment concept and report a case series of nine patients mainly around 30, reporting their comorbidities, medication during treatment and the development of health-related quality of life (HRQoL) scores from before the treatment to the day of release.

Materials and Methods

Eligible patients were retrospectively identified, and demographic characteristics, comorbidities, and concomitant medications were extracted from electronic medical records. HRQoL indices were routinely collected in our clinic at both admission and discharge using the Health-49 instrument and the ICD-10–based Symptom

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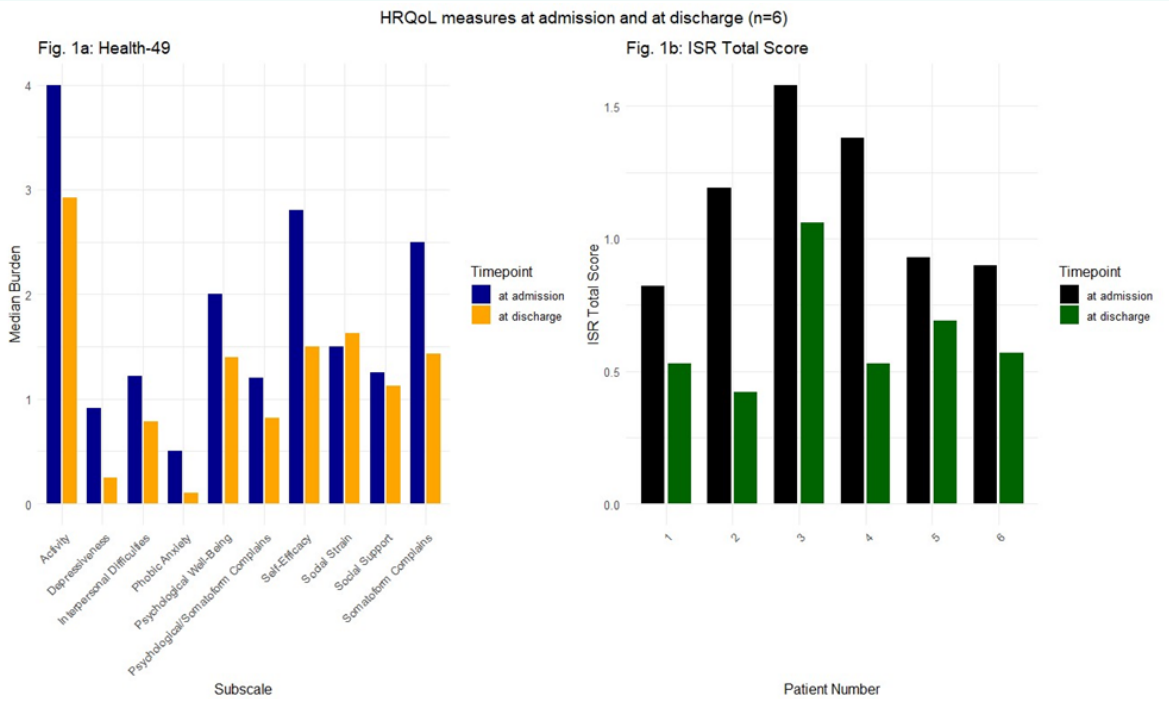

Figure 1: a) Median Health-49 scores per subscale, b) Total ISR score of every included patient at admission and at discharge.

Rating, provided that patients were physically capable of completing these assessments. Descriptive analyses and data visualization were performed using R, version 4.1.1 [17].

Case Presentation

Treatment

Patients presenting with severe manifestations of CFS and PCS were treated in our clinic in a setting deliberately removed from the demands of their usual environments. The therapeutic philosophy emphasized systematic reduction of physiological and psychological strain through radical pacing. The structure of care was individualized and precisely aligned with each patient's functional limitations, which were carefully assessed at admission.

This approach parallels the multimodal treatment programs previously developed in our institution for patients with psychosomatic disorders and disturbances of body image. The regimen integrates psychotherapeutic interventions, cognitive training, and physician-supervised biofeedback therapy.

Given that the cardinal clinical features comprised a profound reduction in physical capacity, manifesting as debilitating fatigue, and diminished cognitive performance, often termed "brain fog," in conjunction with pronounced post-exertional malaise, initial activity intervals were deliberately reduced to the lactate inflection point: three minutes of exertion followed by twenty minutes of rest. Over a typical fourteen-hour therapeutic day, this regimen yielded approximately thirty-seven short training sessions encompassing activities of daily living, such as personal hygiene, as well as light physical or cognitive exercises. The intensity of exertion was increased incrementally in 10% steps, contingent upon individual tolerance and clinical stability.

After approximately three to four weeks, the psychotherapeutic regimen was supplemented by music therapy, physiotherapy, and

Table 1: Patients characteristics and comorbidities.

Characteristics	Number of Patients
Median age [range]	31 [22-68]
Repeated treatment in same institution	n = 4
Discharged in wheel chair	n = 4
Median treatment duration in days [range]	116 [4 - 231]
Additional diagnosis (ICD-10)	
POTS (I49.8)	n = 2
Depression/Anxiety (F41.2/F32.9)	n = 3
Vitamin D deficiency (E55.9)	n = 3
Iron-deficiency anemia (E61.1)	n = 2
Hypothyroidism (E03.9)	n = 2
Hypokaliemia (E87.6)	n = 1
Chronic sleep disorder (G.47.8)	n = 2
Orthostatic Hypotension (I95.1)	n = 1
Arterial Hypertension (I10.90)	n = 1
Thyroid dysfunction (E03.9)	n = 1
Polyneuropahty (G62.88)	n = 2
Exocrine pancreatic insufficiency (K86.83)	n = 2
Somatization disorder (F45.0)	n = 1
Polycystic Ovary Syndrome (E28.2)	n = 1
Functional Dyspepsia (K30)	n = 1
Osteoporosis (M81.99)	n = 1
Tremor (R25.1)	n = 1
Somatic delusions (F22.9)	n = 1
Asperger syndrome (F84.5)	n = 2
ADHS (F90.0)	n = 2
Binge Eating (F50.8)	n = 2
Dizziness and Giddiness (R42)	n = 1
Abnormal cool sensation (R20.8)	n = 1
Pain	
Sore Throat (R07.0)	n = 1
Headache (R51)	n = 1
Myalgia (M79.19)	n = 2
Dysmenorrhea (N94.6)	n = 1

Table 2: Maintenance Medication of Patients during Treatment.

Pharmacological/Nutritional Intervention	Number of Patients
Vitamin D	n = 8
Melatonin	n = 7
Magnesium	n = 6
Ivabradine	n = 3
Aripiprazole	n = 3
Iron supplement	n = 3
Ketotifen	n = 3
Levothyroxine	n = 3
Desloratadine	n = 2
Famotidine	n = 2
Mirtazapine	n = 2
Lorazepam	n = 2
Promethazine	n = 1
Nicotine transdermal patches	n = 2
Creon/Pancrelipase	n = 2
Trimipramine	n = 2
Tilidine/Naloxone	n = 1

body (psycho-) therapy. The latter emphasized Functional Relaxation; a method previously demonstrated to be efficacious in patients with disturbances of body image [18–21]. Serial biofeedback-based stress assessments were complemented by laboratory investigations, including D-dimer measurements and profiles of vitamins and trace elements. Neurological evaluations were conducted in selected cases. Therapeutic interventions were tailored according to clinical findings and included supplementation with vitamins and trace elements, antidepressant or antipsychotic medication as indicated, and, in a minority of cases, nicotine patches or low-dose naltrexone.

Treatment Success

Between August 2022 and August 2025, nine patients with severe Post-COVID syndrome accompanied by chronic fatigue syndrome underwent treatment according to this regimen. Eight patients were female and one male. All patients had received at least two years of supportive care prior to initiation of treatment owing to the severity of their illness. The median age was 31 years (range, 22-68), and the median treatment duration was 116 days (range, 4-231). Four patients were discharged in wheelchairs, and four subsequently returned for a subsequent course of treatment. Comorbidities were heterogeneous; the most frequent were vitamin D deficiency, depression, and anxiety. Five patients reported chronic pain of varying nature. Table I summarizes patient characteristics and comorbidities.

Pharmacologic and nutritional interventions were administered concomitantly in accordance with comorbid conditions and laboratory findings. Table 2 provides an overview of maintenance medications. Nearly all patients received vitamin D and melatonin supplementation; nicotine patches were used in two of nine cases, and low-dose naltrexone in one. Patient-reported outcome measures at admission and discharge were obtainable for only six patients. In three individuals the severity of their chronic fatigue precluded completion of the questionnaires. Median HRQoL scores improved across all Health-49 subdomains except for social strain (Table 3). The most pronounced gains were observed in the self-efficacy, activity, and somatoform symptom domains, with scores improving from 2.80 (0.78) to 1.50 (0.56), 4.00 (0.14) to 2.92 (0.64), and 2.50 (0.97) to 1.43 (0.91), respectively. A modest decline was noted in the median social strain score (Figure 1a).

Consistent with these findings, the ISR demonstrated improvement across all subscales, with the most pronounced reduction in the anxiety syndrome domain, from 1.38 (1.13) to 0.38 (0.65). The median overall symptom burden decreased from 1.06 (0.30) to 0.55 (0.23). Figure 1b depicts the improvement in the ISR total score for each patient individually.

Discussion

We describe a therapeutic paradigm for patients with severe CFS following SARS-CoV-2 infection that emphasizes the systematic reduction of physiological and cognitive strain through sophisticated pacing, complemented by psychotherapeutic, physiotherapeutic, and body-oriented interventions, including Functional Relaxation; a modality previously shown to benefit individuals with disturbances of body image.

Table 3: Median HRQoL before and after treatment (n = 6). Higher values indicate a higher symptom burden.

Health-related Quality of Life	Median burden at admission (*SD*) and interquartile range	Median burden at discharge (*SD*) and interquartile range
Health-49		
Activity	4.00 (*0.14*), IQR: 0.13	2.92 (*0.64*), IQR: 1.13
Depressiveness/Depressive Mood	0.92 (*0.29*), IQR: 0.29	0.25 (*0.43*), IQR: 0.63
Interpersonal Difficulties	1.21 (*1.37*), IQR: 0.89	0.79 (*0.51*), IQR: 0.57
Phobic Anxiety	0.50 (*0.74*), IQR: 0.65	0.10 (*0.63*), IQR: 0.20
Psychological/Somatoform Complaints	1.20 (*0.40*), IQR: 0.57	0.82 (*0.20*), IQR: 0.10
Psychological Well-Being	2.00 (*0.76*), IQR: 0.80	1.40 (*0.74*), IQR: 0.60
Self-Efficacy	2.80 (*0.78*), IQR: 1.15	1.50 (*0.56*), IQR: 0.80
Somatoform Complaints	2.50 (*0.97*), IQR: 1.25	1.43 (*0.91*), IQR: 1.14
Social Strain	1.50 (*0.93*), IQR: 0.94	1.62 (*0.83*), IQR: 1.00
Social Support	1.25 (*0.94*), IQR: 1.44	1.12 (*0.64*), IQR: 0.94
ISR		
Anxiety Syndrome	1.38 (*1.13*), IQR: 1.50	0.38 (*0.65*), IQR: 1.00
Depressive Syndrome	1.20 (*0.19*), IQR: 0.21	1.00 (*0.29*), IQR: 0.38
Eating Disorder Syndrome	0.50 (*1.26*), IQR: 0.84	0.00 (*1.09*), IQR: 0.00
Obsessive-Compulsive Syndrome	0.33 (*0.59*), IQR: 0.92	0.00 (*0.27*), IQR: 0.00
Somatoform Syndrome	1.33 (*0.46*), IQR: 0.75	0.84 (*0.49*), IQR: 0.83
Supplementary Scale	1.46 (*0.54*), IQR: 0.51	0.96 (*0.53*), IQR: 0.61
Total Score	1.06 (*0.30*), IQR: 0.43	0.55 (*0.23*), IQR: 0.13

Across this small cohort of nine severe cases, several comorbid features such as heightened sensory sensitivity, chronic pain, myalgia, orthostatic tachycardia, abnormal tactile sensation and dizziness were consistent with those reported in the literature on PCS and POTS [7,14]. Nearly all patients required vitamin D supplementation, a practice that has been proposed as beneficial in prior studies [22].

Within the limits of sample size, the multimodal intervention was associated with substantial median improvements in nearly all subscales of the Health-49 and ISR instruments, most notably in activity, self-efficacy, anxiety, and somatoform complaints. The median ISR depression subscore in our PCS patients was well below those reported in a cohort of 949 individuals before psychosomatic therapy. By discharge, however, their scores had converged with those typically observed after such treatment [23]. Although formal inferential analysis is precluded, these observations might imply that Post-COVID syndrome may not be uniformly refractory to intervention.

The diversity of therapeutic components invites consideration of somatosensory dysfunction, particularly in proprioceptive processing, as a contributing mechanism in this condition. Somatosensation, encompassing proprioception, nociception, thermoception, and vestibular input, forms the substrate of the embodied sense of self. A central component of proprioception is the sense of force, which regulates both the generation of muscle tension and the subjective experience of effort, heaviness, and fatigue [24,25]. These somatosensory subsystems are functionally interdependent; proprioceptive afferents project to the reticular formation, a brainstem network integral to pain modulation and the regulation of peripheral receptor sensitivity [26].

Therapeutic modalities engaging proprioceptive systems, such as proprioceptive neuromuscular facilitation, have yielded preliminary evidence of benefit for fatigue and pulmonary function in PCS populations [27,28]. Extending this line of reasoning, one might further propose that the observed cognitive impairments ("brain fog") stem from a disruption of proprioceptive regulation, wherein the energetic resources required to support routine cognitive processes become insufficient.

Conclusion

Elucidating the neurological causes of PCS remains an urgent priority. Focused investigation of proprioceptive function may yield critical insights into the pathophysiology of CFS and POTS and inform the development of targeted therapeutic strategies. To date, no interventions have consistently demonstrated significant clinical improvement, underscoring the pressing need for rigorous research in this domain.

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