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A Mixed Methods Study Evaluating a Four-Week Post-COVID Rehabilitation Program: Insights and Satisfaction of Rehabilitants and Employees

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Abstract

Background: Post-COVID syndrome (PCS) affects about 10% of COVID-19 patients, causing persistent symptoms such as chronic fatigue, cognitive impairments, and depression. These symptoms reduce quality of life and work capacity and are therefore targeted in specialized rehabilitation programs. A rehabilitation center in Germany developed a four-week group-based PCS rehabilitation program focusing on energy management. This study provides insights into PCS rehabilitation and evaluates both rehabilitants' and employees' satisfaction with the program, as well as suggestions for improvement.

Methods: This study follows a prospective observational design using a mixed-methods approach. PCS rehabilitants completed questionnaires at the beginning and end of rehabilitation, assessing, among other things, satisfaction with rehabilitation and aspects of the rehabilitation process. Survey responses were analyzed descriptively. Semi-structured interviews were conducted with six employees and eight rehabilitants to explore the satisfaction with the rehabilitation approach from both perspectives. Interviews were analyzed using a deductive-inductive content analysis.

Results: In total, we received at least one questionnaire from 128 of 147 rehabilitants (87.1%). Although responses varied regarding the achievement of personal rehabilitation goals and changes in general health, more than 77% of rehabilitants rated the rehabilitation overall as "very good" or "good". Interview results confirmed general approval of the concept and its adaptation, though further improvements were suggested. Transfer of learned skills into daily life remained a key challenge.

Conclusions: The PCS rehabilitation concept appears to be a suitable and generally well-accepted setting for post-COVID rehabilitants. However, it requires a highly individualized approach. Key elements (should) include pacing, self-management, empathetic care, and stimulus reduction. Screening of the potential rehabilitants and stronger integration of the home environment after the rehabilitation are essential to ensure long-term sustainability of outcomes.

Keywords: Post-acute COVID-19 syndrome, Rehabilitation, Evaluation study, Health care surveys, Interview, Patient reported outcome measures, Fatigue, Return to work

List of abbreviations: B-IPQ: Brief Illness Perception Questionnaire; CFIR: Consolidated Framework for Implementation Research; DRV: German Pension Insurance ("Deutsche Rentenversicherung"); DSQ-PEM: DePaul Symptom Questionnaire - Post-Exertional Malaise; EQ-VAS: EuroQol Visual Analogue Scale; EQ-5D-5L: European Quality of Life – 5 Dimensions – 5 Levels; FSMC: Fatigue Scale for Motor and Cognitive Functions; IMET: Index for Measuring Participation Restrictions; PCS: Post-COVID Syndrome; PHQ-4: Patient Health Questionnaire-4; SPE: Subjective Prognosis of gainful Employment

Introduction

After a COVID-19 infection, about 10% of patients develop post-COVID syndrome (PCS), characterized by persistent or recurring symptoms lasting more than 12 weeks that impair daily functioning [1–5]. Symptoms vary widely, including chronic fatigue, cognitive impairments, and depression, which significantly reduce quality of life and work ability [2,3,5]. Because there is currently no causal drug therapy available, and (acute) treatment options remain limited, medical rehabilitation is indicated [6]. Due to the high prevalence, the variety of symptoms, and the severity of symptoms, specialized rehabilitation programs are needed [2,3,5,7].

In Germany, medical rehabilitation is part of the healthcare system funded by health or pension insurance [8,9]. It aims at restoring functional capacity, participation in daily life, and work ability [10]. A rehabilitation center in Germany developed a specific PCS concept in which groups of about ten participants complete a four-week rehabilitation program. Rehabilitants' satisfaction and treatment outcomes are well-established key criteria within the quality assurance program of the German Pension Insurance [10]. Given the novelty of the PCS concept, it is of particular interest to examine to what extent the concept fulfils these quality criteria. Beyond its relevance within the German rehabilitation system, it enhances understanding of patients' experiences and perceived benefits of multidisciplinary post-COVID rehabilitation, while also informing quality assurance and the further development of rehabilitation programs. Moreover, the findings may offer transferable insights into effective treatment components of post-COVID rehabilitation of international relevance.

Therefore, this study aims to present insights into PCS rehabilitation, to examine satisfaction levels, and to provide suggestions for improvement from the perspective of rehabilitants and employees.

Methods

Design

This prospective observational study was designed as a mixed methods study. It includes questionnaire surveys among rehabilitants at two time points (T): at the beginning (T0) and end of rehabilitation (T1), as well as interviews with rehabilitants and employees (**Figure 1**).

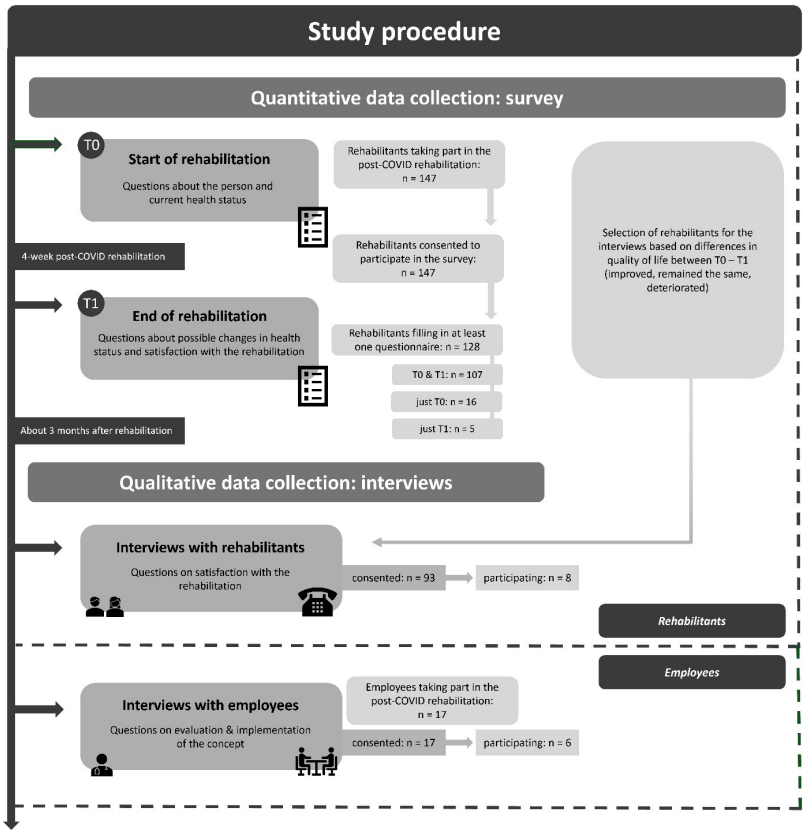

Figure 1. Study procedure

Intervention

The four-week post-COVID rehabilitation program includes about ten rehabilitants starting and completing rehabilitation together, predominantly inpatient (or full-day outpatient). The focus is on energy management and pacing to aid self-management. Energy management and pacing are self-regulation strategies in which rehabilitants balance physical, cognitive, and emotional activity with adequate rest to avoid exacerbation of symptoms. Therapies for practicing energy management and pacing include e.g. occupational therapy (2 times per week, 30–60 minutes) and ergometer training (daily, 30 minutes). Therapy plans also include e.g. seminars on "COVID & Psyche" and "COVID & Cognition". Further components of the rehabilitation plan can be found in the two sample treatment plans in the appendix (see **Appendix I**). Most therapies are group-based. Another feature is the principle of consistent therapists of whom one acts as contact person.

Participants

Patients suffering from PCS who had received approval from the German Pension Insurance for rehabilitation were able to begin their rehabilitation. Inclusion criteria for participation in the post-COVID rehabilitation program included, age ≥18 years, and key symptoms warranting referral. At the rehabilitation center referred to in the study, PCS rehabilitation as a standalone concept is part of the neurology department.

All rehabilitants taking part in the post-COVID rehabilitation were asked to participate in the survey.

Interviewees were selected based on changes in quality of life (EQ-VAS, range: 0–100) between the beginning (T0) and the end of rehabilitation (T1). If the score increased by one point or more from T0 to T1, these rehabilitants were classified as having improved (n=4, interviewees had increased scores of +26, +20, +17, and +17). If the score decreased by one point or more between T0 and T1, these rehabilitants were classified as deteriorated (n=2, interviewees had decreased scores of -20, and -5). If rehabilitants had exactly the same score at T0 and T1, they were classified as having remained the same (n=2, interviewees had 0 and 0). Due to limited financial resources (e.g., for expense reimbursements), the number of interviews was determined in advance in the project proposal. Four individuals who had improved were selected because it was assumed that this would allow us to determine what had helped them, and to identify potential areas for improvement for those who had deteriorated or remained unchanged. For practical reasons, the interviews were conducted in a concentrated period of time, which is why only four cohorts were eligible. Most importantly, however, no more than four months had passed since the rehabilitation, so that the memories could be as fresh as possible.

The selection of employees was drawn by occupational group to get different perspectives.

Because the PCS team at the rehabilitation center consists of only 17 members in total, the selection was limited. Where possible age and gender were taken into account.

Data collection

Questionnaires

Two questionnaires were developed for the measurement times T0 and T1 for this project. The final versions consisted of 76 items in total at T0 and 67 items in total at T1. Both questionnaires (T0 and T1) are structured in such a way that they consist of various instruments that have been compiled into a single questionnaire (see **Table 1**).

Table 1. Overview of the topics (including measurement instruments) used in the questionnaires at the beginning (T0) and end of rehabilitation (T1).

Topic(s)	Instrument(s)	Abbreviation(s)	Reference	T0	T1
Sociodemographic data	--- *	---	---	X	
Employment status	Subjective prognosis of gainful employment	SPE	11	X	X
State of health / Quality of life	European Quality of Life – 5 Dimensions – 5 Levels	EQ-5D-5L	12–14	X	X
Health impairments	Index for Measuring Participation Restrictions Patient Health Questionnaire-4	IMET PHQ-4	15 16, 17	X X	X
Fatigue	Fatigue Scale for Motor and Cognitive Functions	FSMC	18	X	X
Post-exertional malaise	DePaul Symptom Questionnaire - Post-Exertional Malaise	DSQ-PEM	19, 20	X	X
Illness perceptions	Brief Illness Perception Questionnaire	B-IPQ	21	X	X
Rehabilitation goals	--- *	---	---	X	
Aspects of the rehabilitation process	Inpatient Somatic Care Questionnaire	---	22		X

* Created specifically for this study.

In addition to demographic and employment-related questions, the paper-based questionnaires included validated German versions of standardized instruments assessing quality of life, health impairments, fatigue, post-exertional malaise, illness perceptions, rehabilitation goals, and aspects of the rehabilitation process [11–22].

Further, rehabilitants had the opportunity to describe suggestions of improvement for the rehabilitation concept in a free text section. This paper focuses on all aspects of the rehabilitation process including satisfaction, while results on rehabilitation outcomes are to be published elsewhere.

Data collection was conducted between October 2023 and December 2024. English versions of the questionnaires are available in the appendix (see **Appendix II & III**).

Outcomes and operationalization

Rehabilitation goals and rehabilitation process

The questionnaire covered aspects such as the rehabilitation plan and goals, as well as rehabilitants' satisfaction with and evaluation of the overall rehabilitation experience. To assess the rehabilitation process, the survey included questions about the quality and extent of services received. Therefore, parts of a questionnaire on rehabilitation quality from the German Pension Insurance were used [22].

Interviews

Semi-structured individual interviews were conducted with employees and rehabilitants. Employees were interviewed at the rehabilitation center during working hours in August 2024 without compensation regarding the implementation of the rehabilitation concept. Information such as occupational group, age, and gender was documented.

Rehabilitants were invited to share their personal experiences of the program. Due to the wide geographic distribution of rehabilitants' residences, interviews were conducted via telephone within three months after rehabilitation, in September and October 2024. Rehabilitants received a 30-euro allowance for participation.

Two interview guides were created for this study (see **Appendix IV & V**). The interviews were conducted by research staff members of the study's project team. The interviewers are not employed at the rehabilitation center and have experience conducting interviews. All interviews were audio-recorded and pseudonymously transcribed.

Data analysis

Questionnaires

Participant characteristics and survey responses were analyzed descriptively using absolute and relative frequencies for categorical variables. All analyses were conducted using IBM SPSS Statistics, Version 29 (IBM Corp., Armonk, NY, USA).

Rehabilitants had the opportunity to express suggestions for improvement in free text sections of the T0 and T1 questionnaires. These responses were clustered.

Interviews

We employed a combined deductive-inductive content analysis approach based on Kuckartz and Rädiker (2022) with MAXQDA 24, a software program used in research for qualitative and mixed-methods data analysis [23,24]. Initially, the five main categories were developed deductively from the Consolidated Framework for Implementation Research (CFIR): 1. characteristics of the concept, 2. environment, 3. location, 4. characteristics of those involved, and 5. implementation process [25]. Subcategories were then formed inductively, with the coding scheme being continuously refined. Two researchers were involved throughout the analysis. Portions of the data were coded independently and discrepancies discussed in consensus meetings. In case there were disagreements at a consensus meeting, a third researcher was brought in. The final category system was defined with detailed descriptions and anchor examples (see **Appendix VI**). Reporting followed the COREQ and STROBE checklists [26].

Ethics and data security

The study has been approved by the responsible Medical Ethics Committee (No. 2023-148). All participants provided informed consent. All data were pseudonymized before data handling.

Results

Questionnaires

Response proportions and responder characteristics

Of the 147 rehabilitants taking part in the post-COVID rehabilitation 128 (87.1%) filled in at least one questionnaire (T0, T1, or both), while 107 out of 147 (72.8%) rehabilitants filled in both, the T0 and T1 questionnaire. As not all rehabilitants answered every question, the percentages in the tables (and in the text) refer to the group size mentioned in the title of the table.

Mean age of the rehabilitants was about 50 years (range: 21–68 years) and two third (67.8%, n=82) were female (**Table 2**). Almost 70% suffered from pre-existing disease (66.9%, n=79). Most commonly named pre-existing diseases were obesity ("yes": 29.5%, n=36), heart disease ("yes": 23.8%, n=29), and mental illness ("yes": 23.0%, n=28) and lung disease ("yes": 23.0%, n=28).

Table 2. Characteristics of post-COVID rehabilitants[a].

Variable	Characteristics	n (%)
Age (in years) (n=120)	Mean (SD)	49.4 (11.3)
	Range	21–68
Gender (n=121)	Female	82 (67.8)
	Male	37 (30.6)
	Diverse	2 (1.7)
Job training (n=119)	No formal professional qualification	4 (3.4)
	Apprenticeship	71 (59.7)
	Advanced vocational school / Technical college	22 (18.5)
	University (of applied sciences)	22 (18.5)
Persons in household (n=117)	1	30 (25.7)
	2	52 (44.4)
	3	15 (12.8)
	4	14 (12.0)
	5 or more	6 (5.2)
Pre-existing disease (n=118)	Yes	79 (66.9)
	No	39 (33.1)
Rehabilitation basis (n=127)	Inpatient	120 (94.5)
	All-day outpatient	7 (5.5)

[a] numbers (%) of participants. Numbers differ per variable, due to missing values.

Rehabilitant's feedback on the post-COVID rehabilitation concept

Table 3 shows rehabilitants' answers on questions concerning the post-COVID rehabilitation concept. More than half of the rehabilitants (54.1%, n=60) stated that the care and the treatments they received during rehabilitation were just right for them. Two thirds ("rather yes" or "yes": 67.9%, n=76) agreed that the rehabilitation center had the right care, treatments, and advice for their complaints. Answers concerning achieving your personal rehabilitation goals with the help of the rehabilitation program, show one third each: "no" and "rather no": 35.7%, n=36; "partly": 33,7%, n=34; "yes" and "rather yes": 30.7%, n=31. This also applies to the extent your overall health state changed as a result of the rehabilitation ("strongly deteriorated" and "deteriorated": 35.7%, n=40; "remained the same": 33.9%, n=38; "strongly improved" and "improved": 30.4%, n=34). The timing of the rehabilitation stay in relation to the recovery process was as "far too late" or "too late" by more than half of the rehabilitants (50.9%, n=31) assessed. Three quarters of the rehabilitants (77.0%, n=87) rated the rehabilitation program as "very good" or "good".

In addition, rehabilitants had the opportunity to express further wishes and suggestions for improvement in free text sections of the T0 and T1 questionnaires. Answers were described in **Figure 2**. For clarity, the responses were clustered. This resulted in three relevant key topics.

Interviews

Interviews lasted 31.2 (employees) and 36.5 (rehabilitants) minutes on average. The employees had a mean age of 43.3 years (range: 26–62 years), with women making up 66.7% of the group (n=4). Employees from different professions (neurology, psychology, physiotherapy, occupational therapy, nursing, and administration) participated. The rehabilitants averaged 41.8 years (range: 21–59 years), with 75.0% female (n=6). The results are presented according to the CFIR ([25], **Table 4**).

Characteristics of the concept

Concept adaptation

The employees reported that the PCS concept is continuously being adapted in order to respond to the wishes, needs, and requirements of the rehabilitants.

"At some point, I heard a sentence, 'we're building the plane while flying it'. And that's how it is." (116)

Examples of improvements included the revision of a PCS rehabilitation flyer, later breakfast times, blackout curtains in rehabilitant rooms, and reducing dining room noise with felt chair glides. These were praised by the rehabilitants. Most importantly employees reported that many individualized therapy plan adjustments were made, requiring significant effort.

Table 3. Rehabilitant's feedback on the post-COVID rehabilitation concept[a].

Question	Categories (n (%))					
	Far too little	**Too little**	**Just right**	**Too much**	**Far too much**	**n=**
How would you rate the scope of the services (care, treatments and counseling) during rehabilitation? The care and my treatments at the rehabilitation clinic were…	1 (0.9)	19 (17.1)	60 (54.1)	26 (23.4)	5 (4.5)	111
	No	**Rather no**	**Partly**	**Rather yes**	**Yes**	
How would you rate the quality of the services (care, treatments and counseling) during rehabilitation? The rehabilitation clinic had the right care, treatments and advice for my complaints.	2 (1.8)	5 (4.5)	29 (25.9)	35 (31.3)	41 (36.6)	112
My physicians and therapists discussed the goals of my rehabilitation with me right at the beginning.	6 (5.3)	8 (7.1)	28 (24.8)	32 (28.3)	39 (34.5)	112
My physicians and therapists discussed with me which treatments are best suited to achieve my rehabilitation goals.	5 (4.5)	19 (17.1)	31 (27.9)	29 (26.1)	27 (24.3)	111
My physicians and therapists have encouraged me to deal with the consequences of my illness for my private and professional life.	0 (0.0)	7 (6.9)	24 (23.8)	24 (23.8)	46 (45.5)	101
My physicians and therapists have shown me how I can better deal with the consequences of my illness for my private and professional life.	0 (0.0)	12 (10.7)	24 (21.4)	35 (31.3)	41 (36.6)	112
My physicians and therapists have asked me about possible psychological problems in connection with my illness and its treatment.	7 (6.3)	16 (14.3)	24 (21.4)	26 (23.2)	39 (34.8)	112
Do you think you have achieved your personal rehabilitation goals with the help of the rehabilitation program?	14 (13.9)	22 (21.8)	34 (33.7)	22 (21.8)	9 (8.9)	101
	Strongly deteriorated	**Deteriorated**	**Remained the same**	**Improved**	**Strongly improved**	
In what way has your overall state of health changed as a result of rehabilitation?	9 (8.0)	31 (27.7)	38 (33.9)	27 (24.1)	7 (6.3)	112
	Far too early	**Too early**	**Just right**	**Too late**	**Far too late**	
How do you rate the timing of your stay in rehabilitation in relation to your recovery process? [b]	0 (0.0)	6 (9.8)	24 (39.3)	22 (36.1)	9 (14.8)	61
	Very bad	**Bad**	**Partly**	**Good**	**Very good**	
How would you rate the rehabilitation program overall?	1 (0.9)	3 (2.7)	22 (19.5)	59 (52.2)	28 (24.8)	113

[a] Numbers (%) of participants. Numbers differ per variable, due to missing values. [b] Question was added to the questionnaire at a later point in time.

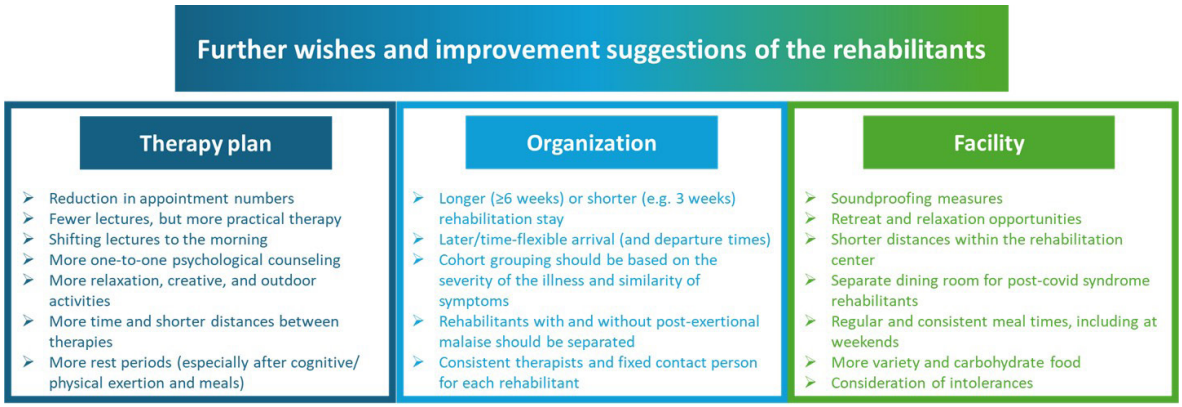

Figure 2. Answers to free text sections of the T0 and T1 questionnaires: further wishes and suggestions for improvement of the post-COVID syndrome rehabilitation concept of the rehabilitants, presented in three key topics.

Table 4. Overview of the interview results according to the Consolidated Framework of Implementation Research (CFIR)[a].

Characteristics of the concept	Environment of the concept	Location of the concept	Characteristics of those involved in the concept	Implementation process of the concept
Concept adaptation Concept is continuously adapted in order to match the specific needs and wishes of the rehabilitants. **Concept feedback** Employees received positive feedback with regard to the concept from the rehabilitants. The rehabilitants mentioned the challenge to apply the learned into everyday life.	**Society** The environment is not fully post-COVID sensitized, which makes the implementation of the learned into everyday life difficult for the rehabilitants **Cost units** Long waiting times for rehabilitation places causes expired cost coverages, which requires a reprocessing of the cost coverages. **Medical / therapeutic care** *Rehabilitants mentioned a lack of post-COVID-specific offers and that there is a lack of knowledge about the post-COVID syndrome.*	**Employees** *The employees were praised for the empathy by the rehabilitants.* *The nursing staff were criticized for a lack of understanding. The changes in therapists (e.g. due to vacation/illness) were also denounced.* **General conditions** Employees criticized a lack of resources (time, rooms). The rehabilitants judged the arrival and departure modalities as badly, as well as the catering, long distances, and a lack of quiet rooms. In contrast, later breakfast times, separate dining rooms, ground-floor accommodation, blackout curtains, and chair glides were praised.	**Rehabilitants** Rehabilitants found it difficult to implement what they have learned in rehabilitation into everyday life. **Post-COVID-Team** Employees were motivated to adapt the concept. They were seen as competent and empathetic, which was praised by the rehabilitants.	**Time / eligibility of rehabilitation**[1] The right rehabilitation time is difficult to estimate and opinions differ about the optimal time. A pre-rehabilitation screening could be a solution, also to better address rehabilitation eligibility and thus be able to implement the concept more effectively. **Capacities & resources** Employees described limited places for therapies and a lack of time.

[1] In order to implement the rehabilitation concept (successfully), the right rehabilitation time, as well as the rehabilitant's eligibility to undergo rehabilitation, must be determined. If rehabilitants participate in the program at an inappropriate time, they are not able to actively engage in rehabilitation and rehabilitation will not be successful.

[a] *Cursive* only reported by rehabilitants - Underlined only reported by employees

Therapies were rescheduled or supplemented (e.g., more heat treatment) and physician rounds were extended. However, neuropsychological diagnostic sessions were shortened from 90 to 60 minutes due to rehabilitant fatigue. Overall, the employees perceived a constant need for adaptation.

Concept feedback

The employees reported that they predominantly received positive feedback from the rehabilitants and that they were satisfied that such a rehabilitation exists.

"And like I said, the patients are, for the most part, very, very happy to be here." (112)

In Addition, the employees described that many rehabilitants specifically wanted to come to the rehabilitation center due to its good reputation. However, some rehabilitants might be dissatisfied. The employees identified the challenge that the rehabilitation does not correspond to the everyday life of the rehabilitants.

"Everyday life is not rehabilitation. Simulating that is also difficult." (114)

Feedback on the rehabilitation concept among rehabilitants varied. Some would not recommend the concept due to lack of health improvement and excessive demands causing setbacks. A lack of individual psychological support was mentioned negatively and overall, a desire for more individualized rehabilitation was expressed.

"Yeah, then the rehabilitation plans themselves. For me it felt like they could maybe be a little more tailored to each person's, yeah, symptoms." (126)

Furthermore, group constellations of two rehabilitants were sometimes problematic because of different performance levels. However, most rehabilitants appreciated the group format, valuing peer exchange. Another aspect that rehabilitants mentioned positively was the support provided by the therapists during the therapies. Seminars were perceived as helpful.

Environment of the concept

Society

Because society is not fully sensitized to the topic of PCS, it is sometimes difficult for the rehabilitants to implement what they have learned in rehabilitation at home.

"At home, it is often the case that, because you simply cannot see it [PCS], you are misunderstood." (23)

Therefore, it was suggested to create routines and to encourage exchange with peers. In order to cope well with the illness, it is important for the rehabilitants to sensitize their environment and create acceptance. Another wish was to inform employers and relatives about PCS.

Cost units

With regard to the interaction with the cost units (German Pension Insurance), it was reported by both employees and rehabilitants that, due to the long waiting times, cost coverage has in some cases expired, requiring additional effort to extend or modify it.

Medical and therapeutic care

Rehabilitants reported that medical and therapeutic care at home is challenging. Difficulties included insufficient (PCS-specific) services and a lack of training and awareness of PCS among physicians and therapists.

Location of the concept

Employees

Rehabilitants praised the competent, empathetic physicians and therapists who provided realistic assessments. Criticism was directed at nursing staff for a perceived lack of understanding, and changes in therapists were also seen as challenging. Besides, the cleaning staff were criticized for the cleanliness of the facilities by the rehabilitants.

General conditions

The arrival and departure procedures, which were very time-consuming, as well as catering, were criticized by the rehabilitants. A more flexible and quieter arrival and admission situation could reduce stress. Long distances within the rehabilitation center were noted.

"Well, I mean, personally, I find the distances really far." (122)

Characteristics of those involved in the concept

Rehabilitants

Pacing and energy management were taught during rehabilitation and were considered very important by the rehabilitants. Besides, the employees perceived a higher level of knowledge among those affected (compared to the first PCS rehabilitation cohorts). Sometimes this exceeds the employees' scope of competence.

"Lately, we've been noticing more and more that the people affected have an extremely high level of knowledge. They really know their stuff and they also want very specific, expert answers from us." (116)

PCS team

Employees initially had to acquire PCS-specific knowledge independently due to the new condition, with many eager to

improve and learn. In addition, all employees were motivated to adapt and further develop the concept.

"[...] but I think this team is especially productive and incredibly fast in adapting the concept. And everyone has good ideas, and yeah, it's kind of like swarm intelligence." (116)

Although the rehabilitants described the physicians and therapists as being very competent and empathetic, as well as honest and supportive, some rehabilitants expressed dissatisfaction with certain staff members.

Implementation process of the concept

Time of rehabilitation/ eligibility for rehabilitation

On the part of the employees, the associated difficulty in estimating the right time for rehabilitation, were named above all.

"And it's always such a fine tightrope act — are they fit for rehabilitation, yes or no? Will they benefit from it?" (116)

This was also mentioned by the rehabilitants, but they disagreed on how they felt about the timing of rehabilitation. Some found it to be too late, others just right or too early. Employees thought it might be helpful to screen rehabilitate eligibility. This could enable rehabilitants to benefit optimally from the rehabilitation.

Capacities and resources

Capacity problems (limited rehabilitation places) and resources constraints (such as time and space capacities) played a decisive role for the employees, because they have an impact on the implementation of the therapies.

Discussion

This study presents insights into a newly developed PCS rehabilitation concept, examines satisfaction levels of the rehabilitants and employees, and provides improvement suggestions for PCS rehabilitation concepts.

Questionnaire results show that over 77% rated the rehabilitation as "very good" or "good", overall. A heterogeneous picture emerged with regard to the achievement of personal rehabilitation goals and the change in general health status. Interview results show that rehabilitants are generally satisfied with the rehabilitation concept and its ongoing adaptation, although further adjustments were necessary. For the rehabilitants it is particularly challenging to transfer the skills learned during rehabilitation into everyday life.

Specification of the rehabilitation concept

The rehabilitation concept has been continuously adapted to the specific needs of PCS rehabilitants, which differ significantly from classic rehabilitative indications [27]. Instead of functional gain as e.g. in neurological rehabilitation settings [28], pacing, self-management strategies, activity reduction, and sufficient rest periods become central and are already part of the PCS concept. Structural factors (e.g., short distances within the rehabilitation center), opportunities for retreat between therapies and after meals, and a less stimulating environment (e.g., lower noise level) are components of a disease-specific setting and were mentioned by the rehabilitants. Such a specification of a rehabilitation setting was also found in a study on rehabilitation needs in COVID-19 survivors and has proven successful for this patient group [29]. Empathy and (disease-related) understanding of the PCS are also relevant. While the empathetic attitude of employees was highlighted positively, a lack of understanding was negatively rated by rehabilitants. Continuity and disease-specific trainings are essential for all employees.

Not all affected individuals benefited equally from rehabilitation, while other studies generally stated that those affected benefit [30]. The heterogeneous perception of the optimal time for rehabilitation and the partial lack of subjective improvement that were reported, argue for the need of screening [29,31]. This should assess both resilience and rehabilitation goals [32] in order to identify those rehabilitants who can benefit from rehabilitation and, if necessary, refer others to alternative care structures.

Discrepancy between rehabilitation setting and home environment

Rehabilitants reported, that transferring pacing strategies to everyday life is challenging. This discrepancy between the protected rehabilitation setting and the often poorly adapted home environment represents a significant obstacle to sustainable effects. Family members, employers, and other persons (e.g. health care providers) often have insufficient knowledge about PCS [33], especially invisible symptoms (e.g. fatigue). This can lead to a lack of understanding [33–35]. That might explain why rehabilitants reported that they want their relatives and employers to be better informed about the PCS, so that they can better support them.

In addition, many regions lack outpatient PCS-specific services that enable continuous support [34]. It seems sensible to supplement rehabilitation programs with structured educational materials for relatives and employers. Structured aftercare programs should be considered to support rehabilitants after discharge (e.g. telephone or digital follow-ups), support groups, or online coaching on self-management [36–38]. The study by Müller *et al*. (2025) also highlights the importance of an aftercare program, for example, to support self-management skills [36].

Strengths and limitations

One key advantage was the mixed methods approach. Questionnaire data helped identify rehabilitants with different rehabilitation experiences, and interviews offered valuable insights into the rehabilitation (process).

With a response proportion of 87% in the survey and a high participation willingness in interviews, a substantial proportion of rehabilitants were represented. Otherwise, it may reflect the high level of suffering of rehabilitants.

The possibility of selection bias cannot be entirely dismissed, as those with the most severe impairments might have been unable to take part. Furthermore, the selection of interview participants is limited to a small number of cohorts of rehabilitation patients and, among staff members, to the PCS team. Also, one rehabilitant selected for an interview was based on a deterioration of -5 (EQ-VAS, T0 and T1) which is below the minimal clinically important difference. The selection of interviewees may have resulted in selection bias, too.

Although the research was conducted within a single rehabilitation center, which may limit its generalizability, participants came from various parts of Germany. The variance among rehabilitants allows to gain helpful insights into a specific rehabilitation program of a novel disease, also relevant for the international rehabilitation audience.

Although evaluating intervention outcomes was not the primary objective of this study, it is notable that almost 36% of participants experienced deterioration in health status. This contrasts with the generally positive program ratings, with 77% evaluating the rehabilitation program as "good" or "very good" and only 3.6% as "very poor" or "poor". Future research could examine whether the observed deterioration in condition was associated with dissatisfaction with the program.

Conclusion

PCS rehabilitation is a suitable and generally positively rated setting for post-COVID rehabilitants. At the same time, an indication-specific, highly individualized approach is required, which clearly differs from classic rehabilitation concepts. Key elements should include pacing, self-management, empathy, and stimulus reduction. In addition, screening is needed to identify suitable rehabilitants, and rehabilitation and the home environment need to be more closely integrated to ensure the sustainability of the rehabilitation interventions.

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Ethics and Data Security

The study has been approved by the responsible Medical Ethics Committee. All participants provided informed consent. All data were pseudonymized before data handling.

Declaration of Competing Interests

AH and NSch are employees of the German Pension Insurance Oldenburg-Bremen (DRV). CU, MF, and JH are employees of the Rehabilitation Center Oldenburg. The other authors declare that they have no competing interests.

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