INTERNATIONAL JOURNAL OF HEALTH PROFESSIONS
Volume 11, Issue 1, 2024, Pages 49–60, ISSN 2296-990X, DOI: 10.2478/ijhp-2024-0002

# Usability of a telerehabilitation program for patients with musculoskeletal or oncological diseases: A mixed-methods evaluation

# Benutzerfreundlichkeit eines Telerehabilitations-Programmes für Patient*innen mit muskuloskelettalen oder onkologischen Erkrankungen: Eine Mixed-Methods Evaluation

Doreen Stöhr[1]*, Martin Matzka[1], Stefan Gschwenter[1], Alexandra Edlmayer[1], David Felder[1], Andreas Spary[2], Gabriele Reiger[3], Martina Honegger[4], Martin Skoumal[4]

*[1]Pension Insurance Institution, Department for Applied Research, Innovation and Medical Service Development, 1020 Vienna, Austria*
*[2]Pension Insurance Institution, Center for Outpatient Rehabilitation, 8021 Graz, Austria*
*[3]3Pension Insurance Institution, Rehabilitation Center Weyer, 3335 Weyer, Austria*
*[4]Pension Insurance Institution, Department for Scientific Research in Rehabilitation, 1020 Vienna, Austria*
** doreen.stoehr@pv.at*

Received 12 July 2023, accepted 24 January 2024

**Abstract**

Purpose: Telerehabilitation may stabilize the results of a previous phase 2 rehabilitation program through remote rehabilitation sessions. We evaluated a new telerehabilitation service (PV RehaTRAIN®) during its initial implementation, focusing on its usability both from the perspective of patients with musculoskeletal or oncological diseases and the interdisciplinary treatment team.
Methods: The evaluation followed a convergent mixed-methods design. After separate qualitative and quantitative analyses of the multi-perspective findings from interviews, focus groups and questionnaires, we interpreted the results collectively and equally.
Results: Overall, the results indicate high acceptance of and satisfaction with the new telerehabilitation service, especially from the patients' perspective and regarding educational and individual counselling sessions. However, the treatment team identified a need for further didactic training to enable them to realize their full professional potential in a telerehabilitation setting.
Conclusion: The new telerehabilitation service PV RehaTRAIN® may bridge gaps in health care for patients who do not have access to conventional phase 3 rehabilitation infrastructure or prefer remote services that are readily integrated into their everyday lives. Members of the interdisciplinary treatment team offering telerehabilitation for the first time need adequate technical and especially setting-specific didactic training. Increased participation of treatment teams when refining telerehabilitation systems may minimize problems in early implementation phases and contribute to the quality of care.

**Abstract**

Hintergrund: Telerehabilitation kann die Ergebnisse einer vorangegangenen Phase-2-Rehabilitation stabilisieren. Wir haben ein neues Telerehabilitations-Programm (PV RehaTRAIN®) in der Testphase evaluiert, wobei wir uns auf die Benutzerfreundlichkeit sowohl aus Sicht der Patient/-innen mit muskuloskelettalen oder onkologischen Erkrankungen als auch aus Sicht des interdisziplinären Behandlungsteams konzentrierten.
Methoden: Die Evaluation erfolgte mittels konvergentem Mixed-Methods-Design. Nach getrennten qualitativen und quantitativen Analysen der multiperspektivischen Ergebnisse aus den Interviews, Fokusgruppen und Fragebögen wurden die Ergebnisse gemeinsam und gleichwertig interpretiert.
Ergebnisse: Insgesamt zeigen die Ergebnisse eine hohe Akzeptanz und Zufriedenheit mit dem neuen Telerehabilitations-Programm; insbesondere aus Sicht der Patient/-innen in Bezug auf die Aufklärungs- und individuellen Beratungsgespräche. Das Behandlungsteam stellte einen Bedarf an weiteren didaktischen Schulungen fest, um sein volles berufliches Potenzial im Telerehabilitations-Setting ausschöpfen zu können.
Schlussfolgerung: Das neue Telerehabilitations-Programm PV RehaTRAIN® kann Lücken in der Gesundheitsversorgung für Patient/-innen schließen, die keinen Zugang zu konventioneller Phase-3-Rehabilitation haben oder Online-Programme bevorzugen, die sich leicht in ihren Alltag integrieren lassen. Mitglieder des interdisziplinären Behandlungsteams, die erstmals Telerehabilitation anbieten, benötigen eine adäquate technische und vor allem setting-spezifische didaktische Ausbildung. Eine stärkere Beteiligung des Behandlungsteams an der Weiterentwicklung von Telerehabilitations-Programmen kann Probleme in frühen Implementierungsphasen minimieren und zur Qualität der Versorgung beitragen.

**Keywords**
telerehabilitation – interdisciplinary rehabilitation – evaluation – mixed-methods design – multi-perspective approach – usability

**Keywords**
Telerehabilitation – Interdisziplinäre Rehabilitation – Evaluation – Mixed-Methods Design – Multiperspektivität – Benutzerfreundlichkeit

## INTRODUCTION

Telerehabilitation is part of the broader field of electronic health care (eHealth) or telemedicine and is defined as the remote provision of rehabilitation services via information and communication technologies (Peretti et al., 2017; Zonneveld et al., 2020). The provision of services can be asynchronous (e.g. via web forums or email), or more comparable to conventional face-to-face rehabilitation, synchronous, meaning that information can be shared by healthcare professionals and patients in real time (Cottrell et al., 2017). Apart from physicians, physiotherapists have been the main providers of telerehabilitation (Peretti, et al., 2017; Cottrell et al., 2017) but the potential for other allied health professionals to contribute significantly to the holistic and interdisciplinary telerehabilitation of patients with complex health needs is increasingly recognized (Cottrell et al., 2017). Services may include assessments, supervision, consultations, counselling, patient education and other interventions tailored to the patients' individual rehabilitation needs. The main, if not ultimate, goal of telerehabilitation is to restore the patients' ability to participate in their everyday, social and professional lives as much as possible (Zonneveld et al., 2020).

Telerehabilitation has been developed to achieve the same health outcomes as conventional rehabilitation as well as to provide continuity of care for patients discharged from different healthcare settings. The potential benefits of telerehabilitation include reducing hospitalization times and associated costs for patients and healthcare providers as well as avoiding travelling times by providing timely rehabilitation services delivered remotely at the patients' home. A key advantage of telerehabilitation, however, is that it gives patients who live far away from established rehabilitation infrastructure access to rehabilitation services otherwise not available to them (Peretti et al., 2017). Accordingly, telerehabilitation is a promising service complementing conventional rehabilitation that is satisfactory for both patients and healthcare providers (Amin et al., 2022).

Interest in telerehabilitation is growing in the research community, as is tentative evidence on the feasibility and effectiveness of these interventions in neurological (Khan et al., 2015; Laver et al., 2020; Seron et al., 2021; Suso-Martí et al., 2021), cardiorespiratory (Seron et al., 2021; Suso-Martí et al., 2021; Cox et al., 2021), oncological (Patel & Kachhwaha, 2021) and musculoskeletal rehabilitation (Seron et al., 2021; Suso-Martí et al., 2021). At the same time, barriers to its successful implementation in practice are becoming more apparent, with usability challenges being most prominent amongst them, which may be a significant factor in non-participation and high drop-out rates for patients. It is imperative to evaluate the ease of learning to use and using new telerehabilitation systems, the user-friendliness of technical equipment and applications, the comprehensibility of rehabilitation content as well as the adequacy of instructions and training on how to use the system (Reinhardt et al., 2021).

As Austria's largest public national pension insurance carrier, the Pension Insurance Institution (PV) is legally obliged to provide its eligible clients with access to rehabilitation in the event of imminent incapacity to work (§ 300 ASVG). After initial rehabilitation in acute hospitals (phase 1 rehabilitation), further in- or outpatient rehabilitation is provided as medically needed in 17 specialized rehabilitation centers operated by the PV or licensed partner facilities. An outpatient phase 3 rehabilitation may follow to consolidate and maintain the previously achieved results of phase 2 rehabilitation. After a legal basis for providing telerehabilitation came into effect in 2019 (§ 302 ASVG), the PV developed a new telerehabilitation system called PV RehaTRAIN® in 2021 under the direction of the previous head physician of the PV, his program-manager and his multi-professional team of doctors, physiotherapists, training therapists and IT-specialists. Another multi-professional team of researchers from the PV was tasked with designing and conducting the present study.

The PV RehaTRAIN® is a real-time, interdisciplinary, and bio-psycho-social rehabilitation service that focuses on patients' "return to employability" to improve and strengthen their re-integration and participation in their professional and social lives. It aims to develop and reinforce health-related skills and knowledge that patients can sustainably integrate in their daily lives and to strengthen their motivation for health-promoting behavior, personal responsibility and self-management. The program was designed to provide content comparable to an established conventional outpatient phase 3 rehabilitation program with a modular and interdisciplinary design to meet patients' individual needs. It is offered to patients who cannot participate in phase 3 rehabilitation for geographical, personal or professional reasons, who have at least basic skills in using communication technology and who have further rehabilitation needs after a phase 2 rehabilitation program. An intake examination including a 2-kilometer walking test and a resting electrocardiogram is conducted at a rehabilitation center to determine patient eligibility and to ensure safe participation. In addition, patients receive detailed in-person instructions and information brochures on the technical side of the system.

PV RehaTRAIN® makes use of synchronous telehealth consultations via real time video conference with an interdisciplinary rehabilitation team for therapeutic and educational sessions as well as digital media to stay in close contact with the patients. The program lasts 12 weeks and includes 1,800 minutes of telerehabilitation divided into 72 sessions of 25 minutes each. Following the

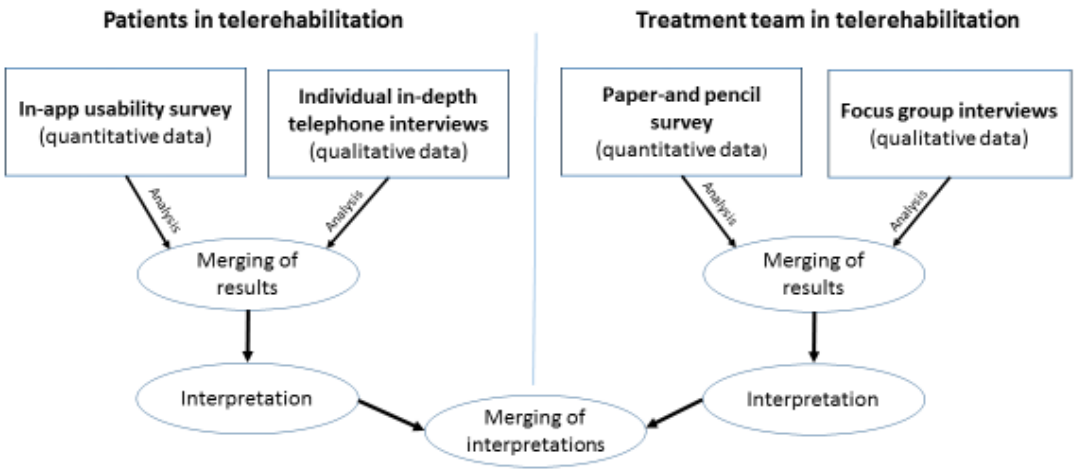


*Figure 1: Convergent mixed-methods design (Creswell & Plano Clark, 2017).*

intake examination, each patient's attending doctor at the rehabilitation center determines which specific sessions they should participate in based on their individual needs and participation goals. Patients are scheduled to participate in telerehabilitation three times a week on average conducted either in individual or group video conferences via Cisco Webex (Cisco Systems). Patients receive online medical counselling from doctors and attend health-related seminars (stress-management and health promotion) by dieticians, psychologists and doctors as well as therapeutic sessions led by a team consisting of physiotherapists, training therapists and occupational therapists. Between sessions, patients are asked to do about 150 minutes per week of endurance training on their own. For this purpose, patients are provided with personal counselling to draw up an individualized training plan and are given a fitness watch to monitor their vital signs (steps taken, type of activity, heart rate, activity duration), a resistance band, fascia ball and a mobile phone app called "REHA.Patient" developed by T-Systems International GmbH. The app is used to keep track of scheduled rehabilitation sessions and exchange data (e.g. documents, self-assessments, vital signs) with the treatment team. This allows the interdisciplinary treatment team to monitor progress in the independent endurance training sessions and suggest changes to the training plan as needed. So far, the program has been offered to patients with musculoskeletal or oncological diseases who still required further rehabilitation at the end of a phase 2 rehabilitation in rehabilitation centers operated by the PV. All sessions were conducted by trained healthcare professionals from two of these rehabilitation centers, but not necessarily by the team that provided the previous phase 2 rehabilitation.

The purpose of the present study is to obtain multi-perspective evidence on the usability of the new PV RehaTRAIN® telerehabilitation system in its pilot implementation stage.

Specifically, the following research questions were addressed:

What motivates patients and their treatment team to participate in telerehabilitation?

What technical infrastructure is available and used by patients and their treatment team in telerehabilitation?

How do patients and the treatment team rate the usability of the telerehabilitation system?

## METHODS

### Research design

We adopted a convergent mixed-methods design (Creswell & Plano Clark, 2017) to collect and analyze qualitative and quantitative data on both the patients' and treatment team's experiences with the usability of telerehabilitation to obtain the most comprehensive understanding (see Figure 1).

The perspectives of the patients in telerehabilitation were explored via an online survey and individual in-depth telephone interviews while those of the treatment team were explored via a paper-and-pencil survey and two focus group interviews. We collected and analyzed patient and treatment team data simultaneously yet separately from each other. Patient and treatment team results were first combined and interpreted separately before being merged at the level of a combined interpretation of results.

### Data collection

At the end of their telerehabilitation all participating patients (for further information see sample description in the results section) voluntarily completed a short survey

embedded in the "REHA.Patient" app regarding the usability of telerehabilitation. The 23-item survey was developed based on the DeLone and McLean Information System Success Model (1992; 2003), which consists of questions on the six dimensions of information quality, system quality, service quality, intention to use, user satisfaction and net benefits.

Our survey covered motives for participation (1 item), demographic information (3 items), IT infrastructure available/used (4 items), and made use of a 5-point Likert scale with items focusing on general usability (6 items) as well as treatment experiences (4 items) and satisfaction (5 items). In addition, patients were invited by a trained researcher (D.S.) to participate in non-directive, in-depth telephone interviews to elicit their subjective experiences and personal perspectives regarding the usability of telerehabilitation. The interviews were based on a catalogue of topics (positive and negative experiences with telerehabilitation in general, the treatment team, the different sessions, health progress, dealing with the technical infrastructure and recommendations for the further development of the program) and were documented by postscripts immediately after completion.

To explore the experiences of the interdisciplinary treatment team with telerehabilitation, the patient survey mentioned above was adapted and executed as a paper-and-pencil survey including 27 items on demographic information (2 items), personal opinions or experiences (3 items), therapeutic handling (8 items), technical handling (10 items) and satisfaction (4 items). The survey was then used as a stimulus and structuring element for two focus group interviews conducted by D.S. It was handed out in four separate thematic parts during the focus group sessions to doctors, therapists and psychologists who had conducted the telerehabilitation program. After filling in and discussing each thematic part, the participants handed in that part of the survey. The main topics of discussion thus corresponded to the topics on the survey, which could be refined and elaborated on in more detail by the focus groups. A detailed protocol of the discussion was written up for both focus group interviews. The data were collected between April 2021 and March 2022.

## Analytical strategy

Once data collection was complete, we used descriptive statistics in SAS Viya 3.5 to analyze the patients' survey data. Frequency tables were used for the Likert-scale items and the mean values, standard deviations and ranges were calculated for continuous variables by S.G. The qualitative analysis of the patient data derived from the postscripts, led by D.S., was iterative in nature based on the strategies of constructivist grounded theory (Charmaz, 2014). We followed pragmatic grounded theory procedures, led by D.S., but reviewing and working on the postscripts themselves became increasingly analytical (Dellwing & Prus, 2012). The postscripts were processed and elements were related to each other by means of applied grounded theory. The underlying inductive coding method was that of constant comparison (Strauss & Corbin, 1990). The codes were then condensed into superordinate categories using MAXQDA version 22.0.1.

The quantitative survey data from the treatment team were analyzed descriptively in the same manner as the patient data. The qualitative focus group interview protocols were analyzed independently of the related survey data using an iterative method that utilized coding techniques in which interpretative closure emerges through the processual, ever-new ordering of piles of codes and lines (Dellwing & Prus, 2012).

In a next step, the quantitative and qualitative findings were merged and interpreted separately from the perspective of patients and the treatment team. This process of grouping quantitative data within the categories previously identified by qualitative research was led by D.S. and S.G., and allowed a mutual validation of the findings. Finally, the interpretations of both patient and treatment team results were merged by D.S., S.G., M.M. and A.E. This step allowed new explanatory approaches to interpreting the collected data and provided a multi-perspective description of the usability of telerehabilitation.

## Research ethics

Patients participated in the pilot phase and subsequent evaluation of telerehabilitation on a strictly voluntary basis. Towards the end of their phase 2 rehabilitation program, eligible patients were given comprehensive information by their attending doctor about the option of participating in telerehabilitation as well as its contents and aims. Those who subsequently applied for telerehabilitation were examined in a face-to-face setting at a rehabilitation center to confirm their suitability for participation. In the case of sudden health issues or questions, patients were instructed to contact their attending doctor, or, if necessary, the national emergency services.

Patients could discontinue telerehabilitation at any time and could also choose not to participate in its evaluation by not completing the usability survey in the app or declining a telephone interview. There were no negative consequences if patients were unable to complete all scheduled rehabilitation sessions.

Data from the treatment team who participated in the survey or focus group interviews were treated with the greatest possible confidentiality to guarantee team members the highest possible level of anonymity from their superiors and employers. Only the researchers

were aware of the identities of focus group participants; personal or identifying data were not included in the analysis or otherwise shared.

## RESULTS

The multi-perspective data were analyzed qualitatively and quantitatively with a focus on usability. Important contextual information is provided by a sample description, motives for participation and the availability and use of technical equipment. Assessments of usability are then presented in a structured manner.

### Sample description

Eighty-nine patients participated in telerehabilitation; 86 of them completed the program and filled in the usability questionnaire. The majority of the sample consists of patients that underwent telerehabilitation due to musculoskeletal diseases (77%) and the remaining participated due to oncological diseases (23%). The sample consisted of about two thirds of female patients and about one third male patients with a mean age of 44 years (*SD* = 9.2). See Table 1 for the educational and employment background of the patients in the sample.
Out of this sample, 22 patients (16 female, 6 male; M = 41.6 years, SD = 10.2; 12 with musculoskeletal diseases, 10 with oncological diseases) also agreed to an in-depth telephone interview, including three patients who discontinued telerehabilitation.
The treatment team sample (n = 24) was composed of 19 therapists (physiotherapists, training therapists, occupational therapists), 8 doctors and 4 psychologists; 13 were female and 11 were male.

### Individual motives for participation in telerehabilitation

Patients' main motives for participating in telerehabilitation were saving time on travel (71%) as well as sufficient technical skills and equipment for participation (63%). A more detailed description about patients' individual motives for participating is shown in Figure 2.
In the telephone interviews, the patients confirmed that saving time on travel to and from the rehabilitation clinic was decisive for their initial and continued participation in telerehabilitation. In combination with the flexible scheduling of rehabilitation sessions, this allowed them to maintain a high level of adherence to the rehabilitation program while still being able to fulfil their family, household and work commitments.
The reasons most frequently cited by the treatment team for participating in telerehabilitation were the desire to be actively involved in improving a new rehabilitation service (58%) and being assigned to the project (55%). Further reasons for participation are shown in Figure 3.

*Table 1: Patients' characteristics.*

| Characteristics | Category | n (%) |
|---|---|---|
| **Sex** | | |
| | Female | 55 (64) |
| | Male | 31 (36) |
| | **Total** | **86 (100)** |
| **Indication** | | |
| | Musculoskeletal diseases | 67 (78) |
| | Oncological diseases | 19 (22) |
| | **Total** | **86 (100)** |
| **Highest educational level** | | |
| | Compulsory school | 4 (5) |
| | Apprenticeship | 20 (24) |
| | Vocational middle school | 13 (15) |
| | University entrance qualification | 18 (21) |
| | University degree | 26 (31) |
| | Other qualification after university entrance qualification | 4 (5) |
| | **Total** | **85 (100)** |
| **Employment situation** | | |
| | White-collar | 67 (79) |
| | Blue-collar | 12 (14) |
| | Currently not employed | 3 (4) |
| | Receiving social benefits | 3 (4) |
| | **Total** | **85 (100)** |

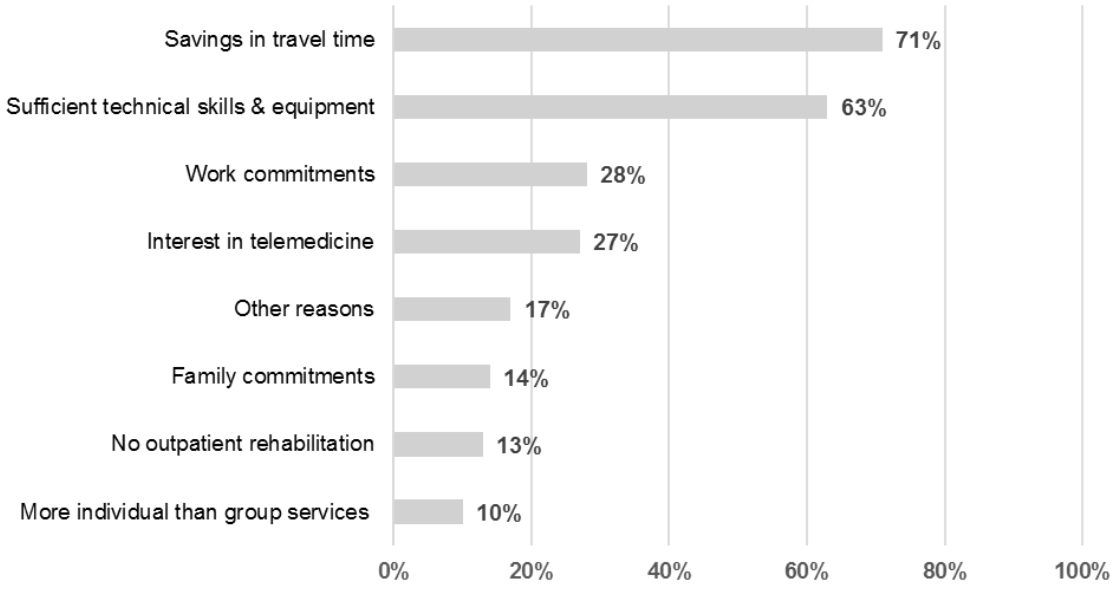


*Figure 2: Patients' individual motives for participating in telerehabilitation (multiple responses possible, n = 86).*

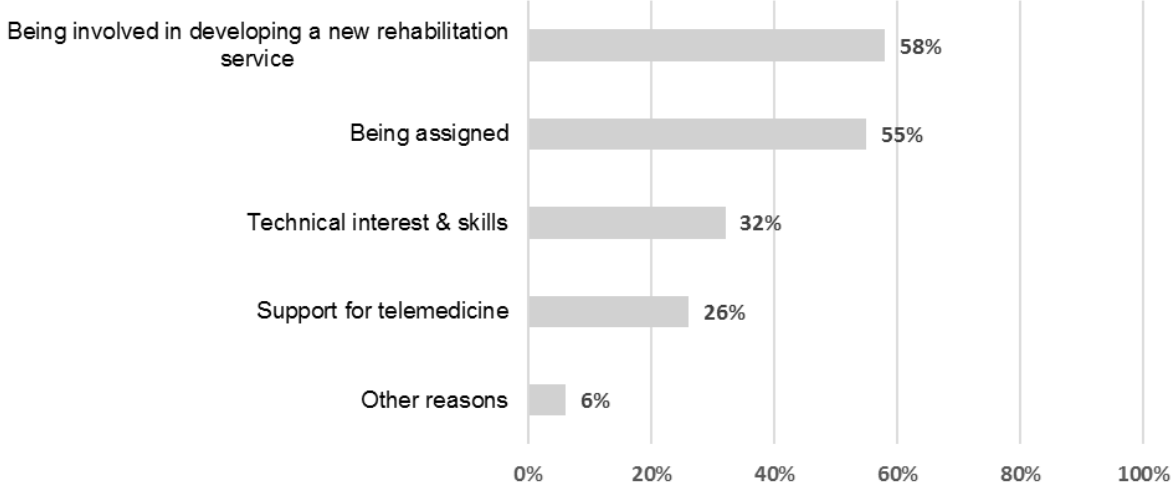


*Figure 3: Treatment team's individual motives for participating in telerehabilitation (multiple responses possible, n = 31).*

## Availability and use of technical infrastructure

With regard to the technical infrastructure for telerehabilitation available to patients at home and the treatment team see Figure 4.

In the telephone interviews, patients described their internet connections as generally being fast and stable enough to follow the information and instructions provided by the treatment team well and with satisfactory audio and video quality. The same applies to the consultations and seminars via video conferencing. While it was possible to participate in the telerehabilitation sessions via smartphone, the patients considered the limited screen size as inadequate to follow the sessions. Laptops proved to be the most suitable device as their screens were large enough but it was still easy to transport them to rooms large and secluded enough to do exercises.

In the focus groups with the treatment team, the members emphasized that equipping the workplace with high-quality microphones and easily adjustable cameras was essential to be able to adapt to different situations and demands. Laptops were mainly used as mobile workstations because they could be easily moved to the rooms allocated for telerehabilitation in the rehabilitation

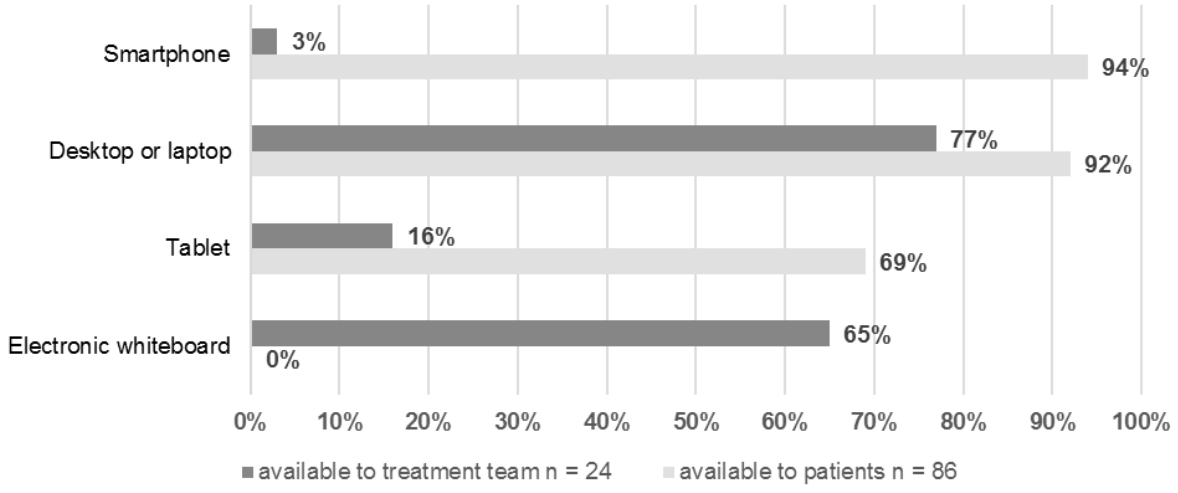


*Figure 4: Technical infrastructure available for telerehabilitation (multiple responses possible).*

center. Desktop computers were preferred for individual consultations with patients and for educational sessions. The treatment team stressed the importance of a high-quality camera in a suitable position for both sides so that therapists were able to closely monitor how the patients were carrying out their exercises and correct them if necessary.

## Usability of the telerehabilitation system

### *Learning how to use the system and remaining training needs*

The treatment team rated the use of the telerehabilitation system as more difficult to learn than the patients (see table 2). The treatment team provided more detail on the adequacy of the specific technical training sessions for using the telerehabilitation infrastructure, with 28% agreeing and 53% partly agreeing that they received sufficient technical training to perform telerehabilitation. The remainder neither agreed nor disagreed (13%) or partly disagreed (6%). In the focus groups, it became apparent that, in addition to technical training, setting-specific didactic competencies must be taught more extensively as strategies and skills established in face-to-face rehabilitation cannot always be applied. This is especially true for the optimal positioning of the webcam during sessions and specific strategies for communication and providing information in online settings.

### *Exchanging information within the system*

Patients agreed more often than the treatment team that they can exchange information comprehensibly during telerehabilitation (see table 2). In the interviews, patients described that both entering and exchanging information in the REHA.Patient smartphone app as well as transferring fitness watch data via the app were easily manageable. Treatment team members greatly appreciated the reliable information provided by the fitness watch that allowed them to receive periodic feedback on endurance training progress and, if necessary, adapt training plans accordingly. However, easier access to full patient records would be important for the team to individualize rehabilitation sessions and avoid time-consuming enquiries prior to each session.

### *Conveying therapeutic content in different session formats*

Most patients were of the opinion that the therapeutic content could be conveyed well. The treatment team was far more critical of their performance, as they were much less of the opinion that the content could be conveyed adequately (see Table 2).
Table 3 shows the rating of the treatment team in terms of the feasibility and comprehensibility of specific session formats in a telerehabilitation setting. Patient education seminars are rated as being in the most suitable format opposed to individual therapy/counselling sessions or group training sessions. More than half the team rated seminars as either very good (59%) or good (27%) for clearly conveying therapeutic content (see Table 3).
The patients we interviewed considered the delivery of therapeutic contents in different session formats to be satisfactory as they perceived the treatment team to be very motivated and eager. The treatment team described some of their observations and difficulties while delivering certain therapeutic contents in telerehabilitation: clinical assessments and monitoring cannot be performed in the

same way as in face-to-face settings, physical contact with patients is missing and some patients rarely addressed their individual physical complaints in group training sessions. Larger group sizes and suboptimal positioning of webcams made it more difficult to correct patients' wrong positions during exercises. Some therapists suggested using multiple webcams to demonstrate the correct execution of exercises from several angles simultaneously. An important additional lesson was to ensure a clear contrast between the therapists' clothing and the background. Finally, some therapists noted that individual therapy sessions are necessary to address individual physical problems but could otherwise be substituted by group sessions.

### *Time required and time allotted for telerehabilitation sessions*

The majority of patients agreed that the amount of time spent on telerehabilitation was appropriate. The treatment team rated whether the time required to conduct a telerehabilitation session was comparable to a face-to-face session. The majority of the treatment team disagreed with this statement (see table 2).

In the telephone interviews, patients explained that some degree of coordination with everyday responsibilities was necessary to participate in the program. In particular, they had to coordinate closely with their employers and families to ensure that participation was compatible with their work schedules and family commitments. Patients addressed work and family obligations that could not be postponed as well as tiredness after work as reasons for missing some of the telerehabilitation sessions. As a result, some patients would have preferred to attend only two telerehabilitation sessions a week instead of three.

In the focus group interviews treatment team members discussed the time required to conduct a telerehabilitation session and mostly agreed that the online sessions were more time consuming than conventional rehabilitation sessions. Reasons given for this included organizing and returning necessary work equipment (e.g. laptops), preparing the assigned rooms and unfamiliar administrative and/or technical issues that were associated with implementing the telerehabilitation system. This suggests the need for real-time technical support (e.g. a hotline) for both patients and the treatment team to avoid delays and frustrations during sessions.

### *Satisfaction with telerehabilitation in its current state*

Patients predominately reported being very satisfied (65%) or satisfied (33%) with the therapeutic contents of telerehabilitation. Likewise, about two-thirds of the patients interviewed stated that they were very satisfied (64%) with the amount of care provided via telerehabilitation. Slightly more than a quarter (28%) said they were satisfied, with fewer patients reporting neither satisfaction nor dissatisfaction (7%) or dissatisfaction (1%) in this regard. Patients' subjective assessment of the extent of improvement in their health after telerehabilitation can also be interpreted as a fundamental, albeit indirect, indicator of satisfaction with the treatment: a large majority of patients agreed (43%) or partly agreed (44%) that their health improved through telerehabilitation, with fewer patients neither agreeing nor disagreeing (10%).

The treatment team was somewhat more critical of the telerehabilitation services. Slightly less than half were satisfied (13%) or partly satisfied (34%) with the current service. The other half were neither satisfied nor dissatisfied (50%). The team perceived patient adherence to appointments to be high despite possible technical problems: most of the team members agreed (19%) or partly agreed (56%) that adherence was high amongst patients, with fewer neither agreeing nor disagreeing (19%) or partly disagreeing (6%). In addition, over half of the team agreed (22%) or partly agreed (34%) that they would recommend their future patients to participate in telerehabilitation. A quarter of the team neither agreed nor disagreed (25%) or partly disagreed (19%) at this point in the implementation of telerehabilitation.

Patients expressed generally positive views on the telerehabilitation sessions in the telephone interviews: they felt that they were very well looked after by the treatment team, well supervised and guided safely through the exercises in the training sessions. Some reported that family members also followed certain sessions attentively and were even motivated to covertly co-participate in training sessions. More critical comments related less to the contents and provision of telerehabilitation than to its administrative requirements. In particular, scheduling appointments, which was done via email during the pilot implementation phase, was experienced as inconvenient. From the patients' point of view, scheduling and managing sessions should be integrated into the REHA. Patient app. Related to this is the patients' desire for a more homogeneous allocation of participants to group sessions, i.e. participants should have comparable health-related limitations so that the exercises can be done by all participants according to their needs and equally well.

The treatment team elaborated on several observations and concerns related to their satisfaction with telerehabilitation in the focus group interviews, some of which aligned with those of the patients. The team would also welcome a more streamlined process for scheduling and administering appointments to be able to focus exclusively on therapeutic work. They also considered it useful to assign patients to specific groups depending

*Table 2: Comparison of the treatment team's and patients' views on the use of telerehabilitation.*

| Agreement | Response, n (%) | | | | | |
|---|---|---|---|---|---|---|
| | Agree | Partly agree | Neither | Partly disagree | Disagree | Total |
| **Ability to quickly learn how to use the telerehabilitation system** | | | | | | |
| Patients | 74 (86) | 9 (10) | 2 (2) | 1 (1) | 0 (0) | 86 (100) |
| Treatment team | 12 (39) | 14 (45) | 5 (16) | 0 (0) | 0 (0) | 31 (100) |
| **Information exchange was comprehensible** | | | | | | |
| Patients | 68 (79) | 16 (19) | 1 (1) | 1 (1) | 0 (0) | 86 (100) |
| Treatment team | 3 (9) | 16 (50) | 8 (25) | 4 (13) | 1 (3) | 32 (100) |
| **Therapeutic contents were adequately conveyed** | | | | | | |
| Patients | 68 (79) | 17 (20) | 1 (1) | 0 (0) | 0 (0) | 86 (100) |
| Treatment team | 4 (13) | 11 (35) | 12 (39) | 4 (13) | 0 (0) | 31 (100) |
| **Amount of time spent on telerehabilitation was appropriate** | | | | | | |
| Patients | 41 (48) | 29 (34) | 11 (13) | 4 (5) | 1 (1) | 86 (100) |
| **Time for conducting telerehabilitation was comparable to face-to-face sessions** | | | | | | |
| Treatment team | 3 (10) | 4 (13) | 5 (16) | 11 (35) | 8 (26) | 31 (100) |

*Table 3: The treatment team's assessment of the feasibility and comprehensibility of different session formats.*

| Rating | Response, n (%) | | | | | |
|---|---|---|---|---|---|---|
| | Very good | Good | Neither | Bad | Very bad | Total |
| **Feasibility and comprehensibility of different session formats assessed by the treatment team** | | | | | | |
| Patient education seminars | 13 (59) | 6 (27) | 2 (9) | 1 (5) | 0 (0) | 23 (100) |
| Individual therapy and counseling | 10 (36) | 9 (32) | 4 (14) | 5 (18) | 0 (0) | 28 (100) |
| Group training sessions | 5 (20) | 6 (24) | 13 (52) | 1 (4) | 0 (0) | 25 (100) |

on their health-related limitations but also according to their physical fitness and the degree of difficulty or intensity of the exercises in order to optimally meet the patients' needs. In addition, they believed that certain routines necessary for conducting telerehabilitation, especially organizing work equipment and preparing for sessions, are not yet well aligned with their parallel duties in conventional rehabilitation. In general, the team still considered telerehabilitation to be an appropriate rehabilitation format although further development and differentiation should be considered to optimally meet patients' individual needs.

## DISCUSSION

We evaluated the usability of a new telerehabilitation system (PV RehaTRAIN®) in an early pilot implementation phase. Data were collected from a relatively young, well-educated and predominately female sample of patients undergoing telerehabilitation due to musculoskeletal or oncological diseases as well as from their interdisciplinary treatment team. The multi-perspective findings from questionnaires and interviews were merged at the level of interpretation to provide a solid basis for the further refinement of the rehabilitation program. Overall, the results of this study reveal a discrepancy between most of the usability assessments of the patients and the treatment team, with the patients reporting greater satisfaction with the telerehabilitation system.

We found that patients participated in telerehabilitation primarily because, in comparison with conventional rehabilitation, they expected to save time that they could spend on other commitments. While this expectation was largely fulfilled for patients, the findings seem to be reversed for some members of the treatment team. Unfamiliar and not yet optimized work processes for the delivery of telerehabilitation in its current stage of development took more time than conventional rehabilitation, which meant that the time required for the treatment team was not comparable between the two settings (McCue et al., 2010; Caughlin et al., 2020). The existing technical training sessions to familiarize users with the telerehabilitation system seem to be more adequate for patients than for the team although both groups generally acknowledged that they could easily learn how to use the system after training. The physiotherapists

and training therapists in particular pointed out that they needed additional training sessions with a different focus to be able to utilize their professional potential fully in this new setting (Moffat & Kerry, 2018). They were eager to acquire additional setting-specific didactic skills and possibly use additional equipment (e.g. more webcams and laptops) to be able to maintain the high-quality standards they apply in conventional rehabilitation in the telerehabilitation setting as well (Lawford et al., 2019; Signal et al., 2020). To a lesser extent, the team identified further training needs amongst patients concerning both technical skills (e.g. adjusting and positioning webcams) and communication skills (e.g. verbalizing complaints, addressing individual problems in group sessions). This should be complemented by timely support (e.g. a hotline) in case of unexpected technical problems for patients and the treatment team alike.

The flexible timing of telerehabilitation sessions may still remain an important usability issue for patients. Comparable to conventional outpatient rehabilitation, patients should also be able to complete telerehabilitation while continuing to work and/or meet family/social commitments. In the predominantly employed sample of patients in this study, it was found that missing rehabilitation sessions was frequently attributed to work and family-related issues (e.g. appointments that could not be rescheduled). However, the treatment team was critical of some patients' desire to participate less frequently in therapy sessions, emphasizing that this wish must be weighed up against the achievability of therapeutic goals or the intensity of therapy needed to achieve them. A possible step toward greater flexibility would be to offer additional telerehabilitation sessions outside the normal business hours of rehabilitation centers to further increase compatibility with other commitments and adherence to rehabilitation.

In line with the rest of our results, the patients rated the possibility of exchanging information within the telerehabilitation system slightly better than the team. This discrepancy becomes greater regarding the ability to follow therapeutic content in general and in different session formats. Collectively, these assessments suggest that both patients and the team had favorable views on the plain exchange of information, as in patient education seminars and individual counselling sessions. Individual therapeutic sessions were considered useful primarily for addressing highly specific and individual problems; otherwise, group sessions would be sufficient. However, the group session format needs to be improved, especially from the team's point of view. A first step in this direction would be to provide more time for preparing and following up on telerehabilitation sessions and to optimize associated processes (such as access to patient files, scheduling appointments via the app). A further step would be to assign patients to more homogenous therapy groups specifically tailored to their functional limitations and physical performance level (Gutenbrunner et al., 2021).

Finally, satisfaction with telerehabilitation in its current state of development was investigated, with a discrepancy emerging once again between the patients and the treatment team. The patients were largely satisfied with the therapeutic content and the amount of care provided while half of the treatment team had a more neutral view. This indicates that treatment team members, with their extensive professional expertise and experience in rehabilitation, still see significant potential for improving the telerehabilitation system. Nevertheless, the team seemed to be confident that, with their active involvement, such refinements can succeed, since more than half of them would recommend telerehabilitation to their future patients. This goal seems particularly worthwhile since a significant majority of patients indicated that their health improved after telerehabilitation, which, ultimately, can be considered one of the most vital foundations for patient satisfaction.

## Strengths and limitations

A major strength of the present usability evaluation is the multi-perspective study design, which made it possible to elicit the experiences and perspectives of both patients and the treatment team in the context of telerehabilitation. This allowed us to obtain a more comprehensive picture of usability and avoid blind spots. The most important limitation is that patients who participated in the telerehabilitation sessions and its evaluation represent a pre-selected sample: only those with musculoskeletal or oncological diseases who already had basic technical skills were included and thus they were not representative of the overall population. In addition, only 13% of patients stated that they participated because they were unable to attend an outpatient phase 3 rehabilitation program close to their home. This means that the intended main target group for telerehabilitation, for which a gap in healthcare should be bridged in the future, may be underrepresented in the sample. However, for an initial evaluation of the telerehabilitation system in an early pilot implementation phase, the sample size in the study was quite large: all 86 patients who participated in the program also participated in the evaluation and about a quarter of them were interviewed.

## Future directions

The results of this study provide support for the basic usability of the PV RehaTRAIN® telerehabilitation system and simultaneously highlight some crucial areas

for improvement. As the program continues to be refined, evaluated and implemented, it will be crucial to increase the participation of the treatment team in this process. The goals will be to incorporate the team's experiences in the program to an even greater extent and to provide the team with the necessary didactic training to enable them to realize their full professional potential in the telerehabilitation setting.

## ACKNOWLEDGEMENTS

The authors would like to thank the employees of the rehabilitation clinics in Graz, Bad Schallerbach and Weyer as well as their patients for participating in the evaluation of the telerehabilitation scheme.

## ETHICAL APPROVAL

An ethical approval was not obtained. Telerehabilitation is a further development of existing outpatient programs in the legally regulated range of PV services. The standards of good scientific conduct and data protection were observed at all times. The study was registered at ClinicalTrials.gov (ID: NCT05493306).

## CONFLICTS OF INTEREST

The authors declare that they are employees of the Pension Insurance Institution, which operates the rehabilitation centers that offer *PV RehaTRAIN*® telerehabilitation. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institution with which they are affiliated.

## References

Amin, J., Ahmad, B., Amin, S., Siddiqui, A. A., & Alam, M. K. (2022). Rehabilitation professional and patient satisfaction with telerehabilitation of musculoskeletal disorders: a systematic review. *BioMed Research International.* https://doi.org/10.1155/2022/7366063

Caughlin, S., Mehta, S., Corriveau, H., Eng, J. J., Eskes, G., Kairy, D., Meltzer, J., Sakakibara, B. M., & Teasell, R. (2020). Implementing telerehabilitation after stroke: lessons learned from Canadian trials. *Telemedicine and e-Health*, *26*(6), 710–719. https://doi.org/10.1089/tmj.2019.0097

Charmaz, K. (2014). *Constructing grounded theory*. Sage Publications.

Cottrell, M. A., Galea, O. A., O'Leary, S. P., Hill, A. J., & Russell, T. G. (2017). Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: a systematic review and meta-analysis. *Clinical Rehabilitation*, *31*(5), 625–638. https://doi.org/10.1177/0269215516645148

Cox, N. S., Dal Corso, S., Hansen, H., McDonald, C. F., Hill, C. J., Zanaboni, P., Alison, J. A., O'Halloran, P., Macdonald, H., & Holland, A. E. (2021). Telerehabilitation for chronic respiratory disease. *Cochrane Database of Systematic Reviews*, (1). https://doi.org/10.1002/14651858.CD013040.pub2

Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches* (5th edit.). SAGE Publications.

Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

Dellwing, M., & Prus, R. (2012). *Einführung in die Interaktionistische Ethnografie: Soziologie im Außendienst [Introduction to interactionist ethnography: sociology in the field].* Springer. https://doi.org/10.1007/978-3-531-94265-0

DeLone, W. H., & McLean, E. R. (1992). Information system success: the quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95. https://doi.org/10.1287/isre.3.1.60

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean Model of information systems success: a ten year update. *Journal of Management Information Systems 19*(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748

Gutenbrunner, C., Briest, J., Egen, C., Sturm, C., Schiller, J., Kahl, K., Tegtbur, U., Fuhr, H., & Korallus, C. (2021). Fit for work and life: an innovative concept to improve health and work ability of employees, integrating prevention, therapy and rehabilitation. *Journal of Rehabilitation Medicine*, *53*(5), 1–6. https://doi.org/10.2340/16501977-2822

Khan, F., Amatya, B., Kesselring, J., & Galea, M. (2015). Telerehabilitation for persons with multiple sclerosis. *Cochrane Database of Systematic Reviews*, (4). https://doi.org/10.1002/14651858.CD010508.pub2

Laver, K. E., Adey-Wakeling, Z., Crotty, M., Lannin, N. A., George, S., & Sherrington, C. (2020). Telerehabilitation services for stroke. *The Cochrane database of systematic reviews*, *1*. https://doi.org/10.1002/14651858.CD010255.pub3

Lawford, B. J., Delany, C., Benell, K. L., & Hinman, R. (2019). "I was really pleasantly surprised": Firsthand experience and shifts

in physical therapist perceptions of telephone-delivered exercise therapy for knee osteoarthitis - a qualitative study. *Arthritis Care & Research*, *71*(4), 545–557. https://doi.org/10.1002/acr.23618

McCue, M., Fairman, A., & Pramuka, M. (2010). Enhancing quality of life through telerehabilitation. *Physical Medicine and Rehabilitation Clinics of North America*, *21*(1), 195–205. https://doi.org/10.1016/j.pmr.2009.07.005

Moffat, F., & Kerry, R. (2018). The desire for "hands-on" therapy - a critical analysis of the phenomenon of touch. In B. E. Gibson, D. A. Nicholls, J. Setchell, & K. Groven, *Manipulating practices: A critical physiotherapy reader*. 174–193. Cappelen Damm Akademisk/NOASP. https://doi.org/10.23865/noasp.29

Patel, H. J., & Kachhwaha, R. (2021). Effect of telerehabilitation on quality of life of cancer survivors: a systematic review. *RGUHS Journal of Medical Sciences*, *11*(4), 188–194. https://doi.org/10.26463/rjms.11_4_5

Peretti, A., Amenta, F., Tayebati, S. K., Nittari, G., & Mahdi, S. S. (2017). Telerehabilitation: review of the state-of-the-art and areas of application. *JMIR Rehabilitation and Assistive Technologies*, *4*(2), e7511. https://doi.org/10.2196/rehab.7511

Reinhardt, G., Schwarz, P. E., & Harst, L. (2021). Non-use of telemedicine: a scoping review. *Health Informatics Journal*, *27*(4). https://doi.org/10.1177/14604582211043147

Seron, P., Oliveros, M. J., Gutierrez-Arias, R., Fuentes-Aspe, R., Torres-Castro, R. C., Merino-Osorio, C., Nahuelhual, P., Inostroza, J., Jalil, Y., Solano, R., Marzuca-Nassr, G. N., Aguilera-Eguía, R., Lavados-Romo, P., Soto-Rodríguez, F. J., Sabelle, C., Villarroel-Silva, G., Gomolán, P., Huaiquilaf, S., & Sanchez, P. (2021). Effectiveness of telerehabilitation in physical therapy: A rapid overview. *Physical Therapy & Rehabilitation Journal*, *101*(6), pzab053. https://doi.org/10.1093/ptj/pzab053

Signal, N., Martin, T., Leys, A., Maloney, R., & Bright, F. (2020). Implementation of telerehabilitation in response to COVID-19: lessons learnt from neurorehabilitation clinical practice and education. *New Zealand Journal of Physiotherapy*, *48*, 117–126. https://doi.org/10.15619/NZJP/48.3.03

Strauss, A., & Corbin, J. M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications.

Suso-Martí, L., La Touche, R., Herranz-Gómez, A., Angulo-Díaz-Parreño, S., Paris-Alemany, A., & Cuenca-Martínez, F. (2021). Effectiveness of telerehabilitation in physical therapist practice: An umbrella and mapping review with meta–meta-analysis pzab075. *Physical Therapy*, *101*(5), pzab075. https://doi.org/10.1093/ptj/pzab075

Zonneveld, M., Patomella, A. H., Asaba, E., & Guidetti, S. (2020). The use of information and communication technology in healthcare to improve participation in everyday life: a scoping review. *Disability and Rehabilitation*, *42*(23), 3416–3423. https://doi.org/10.1080/09638288.2019.1592246