

What matters in rehabilitation: a mixed methods study of critical success factors from the perspectives of patients and healthcare professionals

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Abstract

The success of rehabilitation is usually assessed based on the results reported by patients and physicians. However, these assessments often vary and frequently fail to take psychosocial and contextual factors into account. This study investigated how Patient Researchers (PRs) and Healthcare Professional Researchers (HPRs) perceive rehabilitation outcomes and which Critical Success Factors (CSFs) they consider most influential. Using a participatory mixed-methods design, 90 anonymized patient records were evaluated and divided into groups based on good, poor, and conflicting outcomes. The participants – 3 PRs and 24 HPRs – assessed the success of rehabilitation and the potential significance of previously identified CSFs. In contrast to the HPRs, the PRs attributed greater influence to psychosocial factors. The HPRs generally provided a more accurate assessment of the outcome ratings in the patient records, correctly classifying 54.5% vs. 47.7%. Ultimately, the most important CSFs were incorporated into the Rehabilitation Expectation and Perception Scale (REPS), a screening instrument for identifying context-sensitive factors that influence rehabilitation success. This new approach supports personalized, context-sensitive rehabilitation planning, aiming to optimize treatment and facilitate a more nuanced assessment of rehabilitation success.

Key Words: classification rehabilitation outcomes, critical success factors, contextual factors, patient involvement, screening instrument.

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The concept of rehabilitation success is multifaceted and context-dependent, extending beyond traditional biomedical indicators. Rehabilitation success is typically assessed by utilising Patient-Reported Outcome Measures (PROMs) and Clinician-Reported Outcome Measures (CROMs). These tools, however, frequently fail to capture the lived experiences, values, and contextual realities of patients undergoing rehabilitation.^{1,2} Discrepancies between PROMs and CROMs are frequently observed, with only low to moderate levels of agreement documented. Patients may report no perceived improvement despite clinical gains, or vice versa, highlighting a bidirectional

mismatch.^{3,4} Recent studies confirm such discrepancies, thereby underscoring the role of psychosocial and contextual factors such as pain intensity, psychological distress, social support, and emotional readiness.⁵⁻⁷

Factors contributing to these discrepancies partially align with the contextual domains recognised in the International Classification of Functioning, Disability and Health (ICF).⁸ The ICF describes functioning as the result of dynamic interactions between health conditions, personal capacities, and environmental conditions. It encompasses personal factors, such as motivation and habits, as well as environmental elements, including service access

and social environment. Even though the ICF provides a comprehensive framework, contextual components (particularly environmental factors) remain underrepresented in routine assessment practice. Additionally, psychosocial constructs such as adherence, epistemic trust, perceived fairness, and emotional readiness are only indirectly reflected and are rarely assessed using standardised instruments or systematically integrated into outcome evaluations.^{8,9} This further reinforces the need to incorporate patient-specific contextual data into rehabilitation planning and evaluation.

The present study aims to provide a comprehensive overview of Critical Success Factors (CSFs) that have been identified as influential in determining rehabilitation outcomes. Consistent with the ICF framework and a practice-oriented perspective, the literature characterises these factors across multiple levels, such as patient-related domains (e.g. self-efficacy, coping strategies, treatment adherence), clinical/interventional factors (e.g. rehabilitation intensity, interdisciplinary coordination), environmental factors (e.g. social support, access to services), and lifestyle/health behaviours (e.g. physical activity, overall health status).¹⁰⁻¹⁵ Despite the extensive documentation, further exploration is required into the relevance of these factors as perceived by patients and professionals.

To provide conceptual and analytical clarity, we define CSFs in rehabilitation as factors that relate to the patient, the intervention, and the environment. These factors can be conceptualised as either temporary states or stable characteristics. They can act as predictors, moderators, mediators or risk factors, influencing both observed rehabilitation outcomes and achievable improvements.

We conducted a participatory mixed methods study that incorporated Patient and Public Involvement and Engagement (PPIE)¹⁶ and invited patients and healthcare professionals to become actively involved as co-researchers. Our primary objective was to systematically explore how researchers perceived meaningful rehabilitation outcomes and to identify the CSFs perceived as most influential in achieving these. These insights enabled us to develop a structured, context-sensitive screening instrument that supports the comprehensive assessment of these CSFs in clinical practice.

Materials and Methods

Study design and participants

This study employed a mixed methods design with embedded PPIE, involving patients and healthcare professionals as co-researchers throughout the evaluation and interpretation process. The study was conducted at the Kitzbühel Rehabilitation Centre, a specialised orthopaedic rehabilitation facility in Austria. Ethical approval was granted by the local ethics committee (EK 1140/2023; approval date: July 6, 2023), and all participants provided written informed consent.

Two research groups participated, comprising 23 Patient Researchers (PRs), all current inpatients in a three-week musculoskeletal rehabilitation programme, and 24 Health-

care Professional Researchers (HPRs) from the centre's multidisciplinary team. Both groups contributed to the structured evaluation of anonymised patient records and the identification of CSFs relevant to rehabilitation outcomes.

Case selection

Anonymised patient records from 2018 to 2022 ($N=8802$) were retrospectively analysed. Records were stratified into three outcome groups based on PROM and CROM trajectories: i) Good performer: improvement in both PROMs and CROMs; ii) Poor performer: worsening in both PROMs and CROMs; iii) Discrepant performer: mixed results, such as improvement in one domain and deterioration in the other.

Figure 1 illustrates the distribution of anonymised patient records across these three outcome groups based on the direction and consistency of PROM and CROM performance and calculated on the basis of standardised differences (D) plus discharge scores (T2) (Figure 1).^{17,18}

Thirty anonymised and standardised case summaries were selected per outcome group (total $n=90$), covering a balanced range of common orthopaedic rehabilitation indications to reflect the clinical case mix. The task involved rating perceived rehabilitation outcomes. Our hypothesis stated that the HPRs, due to their clinical training and familiarity with documentation, would show higher levels of agreement with predefined outcome classifications and greater confidence in their evaluations than the PRs.

Evaluation procedure

Each participant reviewed six anonymised patient records – two per outcome group – and completed a structured form for each. This included health status ratings at admission and discharge (5-point Likert scale: 0=very good to 4=poor), perceived rehabilitation success (same scale), and confidence in judgment. Participants also rated the perceived influence of eight pre-identified CSFs (5-point Likert scale: 0=no influence to 4=very strong influence), which were selected based on prior research on factors contributing to rehabilitation outcomes.¹⁰⁻¹⁵ Additional relevant factors could be added in free-text form and were documented for subsequent analysis.

Preliminary findings and interpretations were discussed in joint workshops with PRs and HPRs. This collaborative process resulted in the collection of a preliminary set of candidate CSFs, informed by clinical experience and patient perspectives, and laid the foundation for the development of a structured screening instrument.

Data analysis

Quantitative data were analysed using standard statistical methods to assess group differences, classification accuracy, and confidence. Qualitative responses were coded inductively and analysed thematically to identify recurring factors influencing rehabilitation outcomes. These formed the basis for further categorisation and the development of a screening instrument to systematically capture and quantify potential factors influencing rehabilitation success (*Appendix A*).

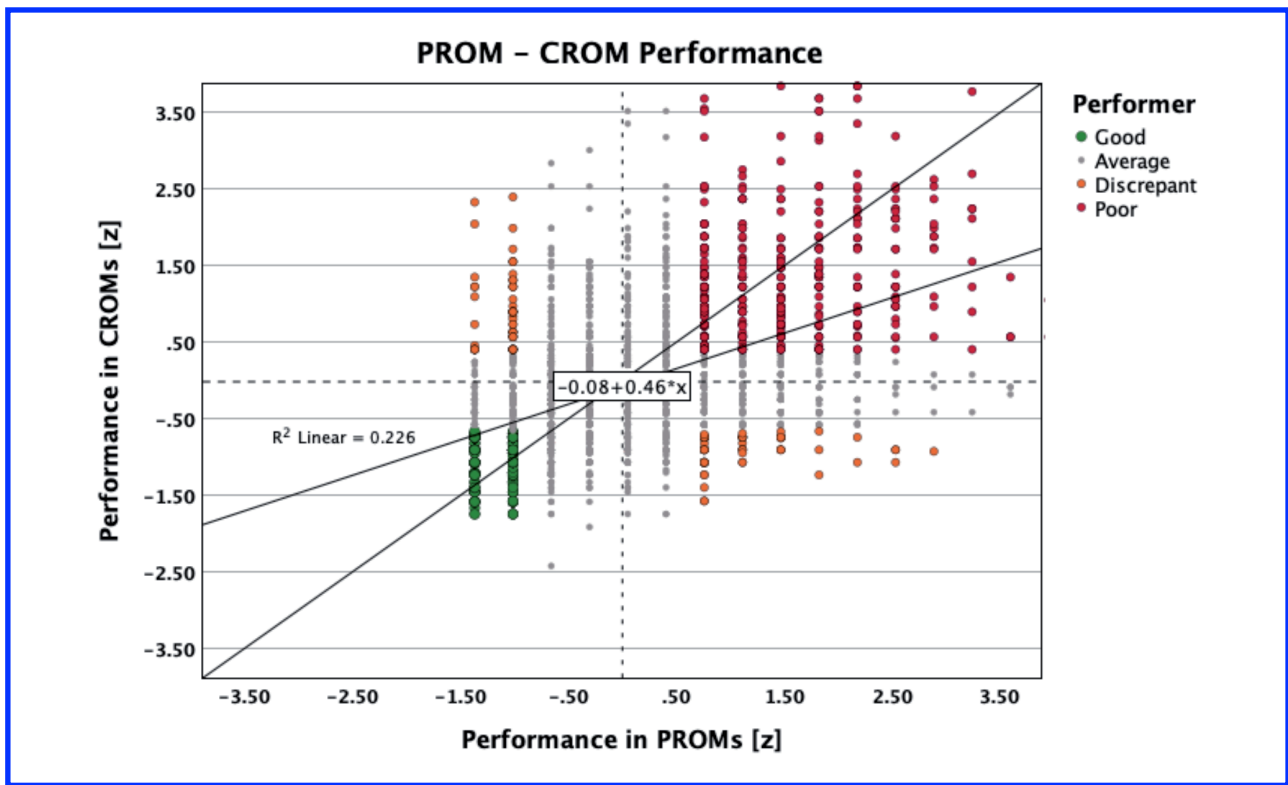


Figure 1. Objective classification of patient records based on standardised outcome measurements.

Results

Characteristics of patient and professional researchers

The Patient Researcher (PR) group (73.9% female; 54.4±13.8 years) was undergoing musculoskeletal rehabilitation. The Healthcare Professional Researcher (HPR) group was predominantly female (83.3%, 33.8±8.7 years) and included a multidisciplinary team consisting of physicians (16.7%), nurses (16.7%), physiotherapists (12.5%), occupational therapists (16.7%), massage therapists (12.5%), dietitians (8.3%), psychologists (8.3%), and other healthcare professionals (8.3%).

Comparison of classification accuracy and confidence between HPRs and PRs

HPRs demonstrated a higher level of agreement with the objective record classifications than PRs ($\kappa=0.30$ vs. $\kappa=0.18$, both $p < 0.001$), correctly classifying 54.5% as compared to 47.7% of the records. HPRs also reported significantly greater confidence in their assessments than PRs ($p < 0.001$, $\eta^2=.049$). Across all participants, the right-positive classification rate was 59.0% for good performers and the right-negative rate was 10.4% for poor performers. The neutral classification rate was 83.1% for poor performers and 41.0% for good performers (Table 1).

Table 1. Agreement between subjective and objective record classification.

[n]	Subjective record classification (by HPR and PR)			
	Poor	Neutral	Good	Total
Objective record classification (by PROMs and CROMs)				
Poor	8	64	5	77
Good	0	32	46	78
Total	8	96	51	155

Perceived influence ratings of pre-identified CSFs by researchers

Participants rated the perceived influence of eight pre-identified CSFs on rehabilitation. While HPRs and PRs showed agreement in their ratings of general health and physical activity, significant group differences ($p < 0.05$) were observed for all remaining factors. PRs assigned higher levels of perceived influence to most factors than HPRs. Table 2 displays the mean ratings of perceived influence for each CSF, highlighting these group differences (multivariate: $p = 0.003$, $\eta_p^2 = 0.099$).

In addition to identifying group-based differences between PRs and HPRs, we also examined how the perceived influence of CSFs varied across objectively classified patient outcome groups. The results showed that ‘self-efficacy’ was rated as significantly influential in anonymised patient records with the best outcomes ($p = 0.013$, $\eta^2 = 0.038$). In contrast, the researchers (PRs and HPRs) attributed the patients’ poor outcomes to ‘medication’ use ($p < 0.001$, $\eta^2 = 0.060$).

Top 12 CSFs selected based on perceived influence ratings (pre-identified + generated)

To identify the most relevant CSFs across both groups (PRs and HPRs), the mean perceived importance ratings for all 55 factors were calculated – including both pre-identified factors and additional factors generated during the case evaluations. The 12 factors with the highest overall mean ratings were selected to form the final item set.

These 12 CSFs, categorised by ICF domains, are presented in Figure 2. This final item set constitutes the basis of the structured screening instrument, developed to assess the relevance and temporal dynamics of perceived CSFs during the rehabilitation process. The full instrument description is provided in *Appendix A*.

Discussion

This study provides a structured, stakeholder-informed perspective of the evaluation of rehabilitation success and the identification of the most influential CSFs. We identified and prioritised 12 CSFs that shape PRs’ and HPRs’ perceptions of rehabilitation outcome by combining structured case evaluations, self-reflection, and participatory input. By taking this approach, we addressed the limitations of existing assessment models, which inadequately account for personal and contextual factors that influence rehabilitation outcomes.

Previous research has demonstrated that PROMs frequently exhibit a discrepancy when compared to CROMs. For instance, in the context of knee osteoarthritis, patients often report experiencing greater limitations than diagnostic tests indicate, a phenomenon that is especially pronounced in cases of pain catastrophising.⁵ In addition, in longitudinal studies of older adults, self-assessed functioning demonstrates persistent over- or underestimation patterns that are linked to demographic and psychological variables.¹⁹ However, such discrepancies have rarely been analysed through the lens of

Table 2. Comparison of perceived influence ratings for pre-identified CSFs between HPRs and PRs.

CSF-ranking	HPRs n=134 Mean±SD	PRs n=122 Mean±SD	p-value	η_p^2
General health status	3.11±0.74	3.15 ±0.94	0.772	0.000
Optimism	2.65±1.04	3.14±0.97	<0.001	0.053
Self-efficacy	2.66±1.01	3.00±0.96	0.011	0.028
Physical activity	2.92±0.80	2.99±0.97	0.577	0.001
Self-care	2.48±1.04	2.96±0.92	<0.001	0.053
Mindfulness	2.28±1.15	2.77±0.93	<0.001	0.049
Social relationships	2.02±1.09	2.51±0.99	<0.001	0.050
Medication	2.10±1.19	2.44±1.09	0.029	0.021
Overall (multivariate)	2.52±0.72	2.87±0.65	0.003	0.099

CSF, Critical Success Factors; HPRs, Healthcare Professional Researchers; PRs, Patient Researchers; η_p^2 , Partial eta squared; SD, Standard deviation; bold text, Statistically significant difference ($p < .05$); Rating scale ranged from 0=no influence to 4=very strong influence.

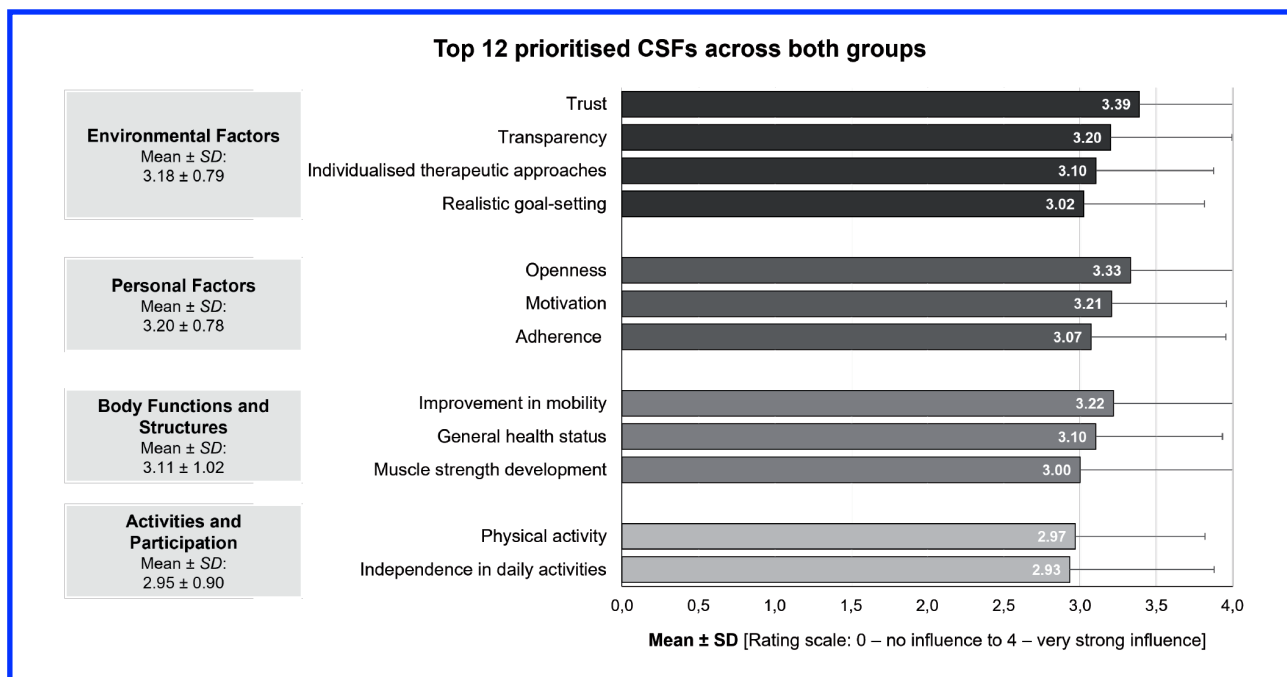


Figure 2. Top 12 prioritised CSFs from pre-identified and newly generated items, based on combined ratings from PRs and HPRs (n=256).

shared case evaluations or compared directly across stakeholder groups.

The current study contributes to the pool of literature by extending our knowledge in two key directions. It demonstrates that PRs and HPRs assess outcomes and perceive levels of influence they attribute to various factors differently. HPRs demonstrated a stronger alignment with predefined classifications and reported higher levels of confidence in their assessments of rehabilitation outcomes based on patient records. However, the classification of the quality of results was only moderately accurate, suggesting that greater subjective certainty in the assessment did not necessarily correspond to a more valid assessment. In the subjective classification of predefined outcome groups, we observed a systematic imbalance: Participants more frequently assigned right-positive classifications – correctly identifying good performers (59%) – whereas right-negative classifications of poor performers (10.4%) occurred far less often. This discrepancy was also reflected in the distribution of ‘neutral’ ratings (*i.e.*, the evaluator concluded that the rehabilitation was moderately successful based on the patient file), which were much more common for poor outcomes (83.1%) than for good ones (41%). The observed “tendency toward the middle”, classifying cases as neutral, especially those with objectively poor outcomes, may reflect an implicit expectation of successful rehabilitation. This is particularly likely in settings where rehabilitation is generally viewed as beneficial or where people do not want to be seen as pessimistic. This suggests that assessment certainty may depend more heavily on perceived information quality than on clinical expertise.

The analysis of structured CSF ratings revealed consistent group-level differences in outcome priorities. PRs rated psychosocial factors – such as optimism, mindfulness, and social relationships – as more influential. These findings align with those of previous research showing that patients tend to favour experiential aspects and clinicians to emphasise measurable outcomes.^{10,20} In addition to the differences observed between researcher groups, we examined whether the perceived influence of CSFs differed among patient records with objectively classified good and poor outcomes. Self-efficacy was rated as particularly influential in cases with good outcomes, whereas medication use was more strongly associated with poor outcomes. CSFs appear to be attributed according to a pattern, whereby researchers credited internal factors such as self-efficacy and motivation for success ($p=0.013$) and considered external factors such as medication as responsible for failure ($p<0.001$). This attribution tendency aligns with classic distinctions in locus of control theory, which suggests that individuals tend to explain positive outcomes by identifying internal causes and negative outcomes by identifying external ones, particularly in health-related contexts.^{21,22}

Our study contributes to the literature by providing a detailed, data-driven comparison of how PRs and HPRs rated the same anonymised patient records and assessed the perceived influence of individual CSFs. This comparison clearly shows that agreeing on general goals is not sufficient for effective care planning; structured tools are needed that assess and reconcile the distinct ways patients and health-care professionals define successful rehabilitation. To facilitate the practical implementation of these insights, a new

screening instrument was developed: the Rehabilitation Expectation and Perception Scale (REPS). In contrast to established measures such as PROMs and CROMs, REPS specifically targets psychosocial and contextual domains that are identified as meaningful by both patients and healthcare professionals. The integration of these dimensions within REPS provides a method useful for identifying subjective priorities that frequently remain unexpressed in routine care. In the future, our research will focus on the evaluation of the instrument's psychometric properties and its feasibility in routine settings. This will facilitate the determination of its broader applicability and relevance for clinical practice.

Several limitations should be considered when interpreting these findings. Firstly, the study was conducted at a single orthopaedic rehabilitation centre, which may limit generalisability to other settings or patient populations. Future research could address this by conducting multicentre studies involving diverse rehabilitation facilities and patient groups. Secondly, while the anonymised case review design ensured standardisation, it reduced access to contextual detail and narrative depth—potentially limiting the richness of evaluation, especially for PRs unfamiliar with interpreting clinical records. However, this limitation was mitigated by complementing the case reviews with in-depth qualitative methods, such as semi-structured interviews and focus groups, which enabled a more comprehensive understanding of individual patient journeys and added valuable contextual insights. Thirdly, participation was voluntary and likely subject to selection bias. PRs may have been more motivated or health-literate than the general patient population, and HPRs may have been more inclined to take part in participatory research. Fourthly, it is important to note that REPS itself is a preliminary instrument and has not yet undergone psychometric validation; future studies should assess its reliability, sensitivity to change, structural properties, and external validity.

Development of a screening instrument for critical success factors

The shared CSFs identified in this study provided a foundation for creating a practical clinical tool, namely the Rehabilitation Expectation and Perception Scale (REPS). Drawing on the 12 most highly rated CSFs, we developed a brief, structured screening instrument intended to support outcome assessment and individualised care planning in rehabilitation settings. The tool consists of 12 items, each corresponding to one of the core CSFs. Items are scored on a 5-point Likert scale (0=strongly disagree to 4=strongly agree), allowing for a standardized assessment of perceived relevance and change over time. It is designed for repeated use at multiple stages of rehabilitation (at admission, discharge) to monitor evolving patient priorities and experiences. Developed through a participatory process and informed by both patient and professional input, the tool encourages shared reflection and brings modifiable personal and environmental factors to the attention of rehabilitation teams. The full instrument description, including item wording, response options, and scoring, is provided in *Appendix A*.

To increase interpretability, measurement properties and practical utility, the 12 CSFs were grouped into four subdimensions, aligned with the International Classification of Functioning, Disability and Health (ICF): A. Environmental Factors, B. Activities and Participation, C. Personal Factors, D. Body Functions and Structures. Each subdimension reflects a distinct domain of the rehabilitation experience. To enable meaningful comparisons across subdimensions of unequal length, mean scores are also computed. In addition to the four subdimensions, the REPS includes two broader summary scores: Contextual Environment and Personal Functioning. The Contextual Environment score reflects how patients perceive the structure, support, and communication in their rehabilitation setting. The Personal Functioning score captures the patient's self-assessment of motivation, confidence, and physical readiness. The total score, which is the sum of all 12 items, provides an overall index of the individual's perceived relevance and importance of rehabilitation.

The REPS can be used at multiple levels: to provide a global overview of perceived rehabilitation conditions, to identify specific strengths or limitations within the subdimensions, and to explore differences between expected and experienced rehabilitation contexts (e.g. admission vs. discharge). Its flexible scoring structure supports individualised care planning, outcome monitoring, and the identification of context-related success factors. In research, it enables hypothesis-driven comparisons with established outcome measures (e.g. PROMs, CROMs) and facilitates deeper insights into rehabilitation experiences, supporting the development of precision and personalised rehabilitation strategies.

Conclusions

This study identified important differences between patients and healthcare professionals in how rehabilitation outcomes and critical success factors are perceived. We prioritised 12 key factors influencing rehabilitation outcomes based on structured case evaluations and input from both patient and healthcare professional researchers, organised into meaningful categories reflecting both perspectives. Building on these findings, we developed REPS—a screening tool designed to capture personal, contextual, and psychosocial factors that are often overlooked in routine assessments. REPS supports a structured, person-centred approach to rehabilitation planning. Further studies are required to confirm the reliability and validity of REPS and to explore its practical utility in diverse rehabilitation settings.

List of abbreviations

CSF, Critical Success Factor
 PROM, Patient-Reported Outcome Measure
 CROM, Clinician-Reported Outcome Measure
 ICF, International Classification of Functioning, Disability and Health
 PPIE, Patient and Public Involvement and Engagement

PR, Patient Researcher
HPR, Healthcare Professional Researcher
D, standardised difference
T2, Discharge timepoint in assessment
REPS, Rehabilitation Expectation and Perception Scale

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Authors contributions

ŠM, CV, MJF and VG, conceptualization; ŠM, CV, and VG, methodology, software, formal analysis, data curation; ŠM, CV, FP, MJF, and VG, validation, writing – original draft preparation; CV, DC, PR, MJF and VG, investigation; MJF and VG, resources; ŠM, CV, FP, MJF, BFS, TS and VG, writing – review and editing; ŠM, CV, visualization; BFS, TS and VG, supervision; CV and VG project administration; all authors have read and agreed to the published version of the manuscript.

Conflict of interests

The authors declare no conflicts of interest.

Ethical approval

Ethical approval for this study was granted by the Ethics Committee of the Medical University of Innsbruck (EK Nr: 1140/2023) on 6 July 2023. All participants provided written informed consent prior to participation.

Data availability

The research data supporting this publication are stored at our institutional digital data repository for published research accessible via <https://creed.lbg.ac.at> (accessed on 06 June 2025). The data sets analysed in this manuscript are not publicly available due to ethical and legal restrictions (data contain potentially identifying and sensitive patient information). However, pseudonymised data sets have been created for the purpose of re-use and are also accessible via creed.lbg.ac.at. Requests for access to anonymised data sets should be directed to the corresponding author [VG].

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