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## Study Protocol

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# Which factors affect the implementation of telerehabilitation? Study protocol for a mixed-methods systematic review with a framework synthesis

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### Abstract.

**BACKGROUND:** Telehealth approaches are promising for the delivery of rehabilitation services but may be under-used or under-implemented.

**OBJECTIVE:** To report a review protocol to identify how much telerehabilitation (telehealth approaches to the delivery of rehabilitation services) have been used and implemented, and which factors have affected such implementation.

**METHODS:** A mixed-methods systematic review with a framework synthesis. Six databases for the scientific literature will be searched, complemented by snowballing searches and additional references coming from key informants (i.e., rehabilitation researchers from a networking group in health services research). We will include English-language empirical research examining the routine use or implementation of telehealth technologies in physical rehabilitation services or by physical rehabilitation professionals from a range of study designs, excepting case studies, case reports, and qualitative studies with  $n < 5$ . Two independent reviewers will perform the screenings, quality appraisals (using the Joanna Briggs Institutes' appraisal

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checklists), and the data extractions. The Consolidated Framework for Implementation Research will be used to synthesize the data on the enablers and barriers of the implementation of telerehabilitation approaches. All the authors will be involved at this synthesis, and key informants will provide feedback.

**CONCLUSION:** The results can inform further implementation endeavours.

Keywords: Telehealth, rehabilitation, uptake

## 1. Introduction

Telehealth is broadly understood as a form of health or rehabilitation service delivery using information and communication technologies (e.g., computers, tablets, mobile phones or applications) when the provider is at the distance of the served person, i.e. a remote service delivery [1, 2]. Telehealth or telerehabilitation approaches (i.e., the latter referring to telehealth approaches applied to rehabilitation contexts) have been gaining increasing attention as a form of service delivery [3–7]. During the COVID-19 pandemic, under lockdown and physical distancing measures, telerehabilitation approaches either have been recommended or sometimes have been the only form of service delivery available for many different types of rehabilitation care (e.g., exercise, coaching, support) [1, 8–11].

However, telerehabilitation approaches are far from new or merely emerging. An increasing body of literature supports its effectiveness and its comparative effectiveness (e.g., non-inferiority) for many health conditions when compared to in-person forms of rehabilitation service delivery [3, 5, 12–14]. The benefits include the potential to increase the outreach of and access to rehabilitation services, including for underserved rural or remote populations of high-income nations [4, 6, 15–17]. Similarly, telerehabilitation solutions have been identified as one means to help address the large unmet rehabilitation needs in lower income countries [7, 18–21], where human resources are scarce and often further apart in a few centralized locations [22]. Yet, despite of the potential benefits and importance, telerehabilitation approaches seem to be under-used and/or under-implemented [23, 24].

Hence, implementation of telerehabilitation approaches has been increasingly studied, notably toward understanding the implementation facilitators or barriers. For example, in the Netherlands a focus group study was conducted as a means to identify why the uptake of eRehabilitation programs (i.e. rehabilitation based on communication or information technologies) have been difficult [24]. Similarly,

a study in Denmark sought frontline practitioners' perspectives on the enablers or barriers to the implementation of telerehabilitation approaches for the Chronic Obstructive Pulmonary Disease [25]. In the United States, a mixed-methods pilot research project explored the uptake and implementation of a tele-monitored home-based exercise program for people with Parkinson's disease [26]. Also in the United States, the barriers and facilitators to the implementation of telerehabilitation in the delivery of care for rural Veterans have been studied from the perspectives of program managers and medical directors [16]. This context notwithstanding, there is no systematic synthesis on the actual use of telerehabilitation or of the factors affecting the implementation of telerehabilitation approaches.

Within the whole context above, the study questions are:

1. How large and of what type is the empirical literature on the implementation of telehealth technologies by physical rehabilitation providers and/or services?
2. How prevalent is the use of telehealth technologies by physical rehabilitation providers and/or services in routine practice?
3. What methodologies have been used to facilitate implementation or sustained use of telehealth technologies among rehabilitation providers and/or services, and how effective have they been?
4. What factors influence the integration of telehealth technologies by physical rehabilitation providers and/or services into regular practice, and which factors influence the effectiveness of any related implementation, sustainment, spread, or scale-up endeavours?

## 2. Methods

Design: Mixed-methods systematic review, combining quantitative and qualitative information, with a framework synthesis. The framework synthesis

116 applies to the analysis the factors that influence the  
117 use or implementation of telehealth technologies, or  
118 the effectiveness of related implementation endeav-  
119 ours.

120 Mixed-methods systematic reviews with a frame-  
121 work synthesis are increasingly common in health  
122 care research, including for studies in subject matters  
123 such as the outcomes of information science and tech-  
124 nology [27] and for factors affecting implementation  
125 endeavours [28, 29]. Systematic review approaches  
126 with a framework synthesis also have been used in  
127 disability and rehabilitation research [30–32], and  
128 in implementation science addressing disability and  
129 rehabilitation topics [30, 31, 33]. Mixed-methods  
130 systematic reviews allow for the integration of  
131 both qualitative and quantitative research data as a  
132 means to provide comprehensive answers to com-  
133 plex, multidetermined research questions [34–37].  
134 We do not use a traditional *aggregative* systematic  
135 review templates, but rather a *configurative* system-  
136 atic review, both combining and synthesizing diverse  
137 types of knowledge into an overarching framework  
138 [35, 38–41]. Instead, with the objective of combin-  
139 ing quantitative and qualitative information, we will  
140 use a ‘data-based convergent synthesis design’, with  
141 all types of data synthesized under the same method  
142 [37, 39]; herein, quantitative or mixed-methods data  
143 will be synthesized qualitatively within thematic cat-  
144 egories [39, 40, 42], while those categories will be  
145 derived from an a priori conceptual framework.

146 Within such rationale, we will apply the “frame-  
147 work synthesis” approach to the data synthesis [40,  
148 43], framework synthesis approaches are deductive  
149 forms of qualitative data synthesis (i.e. use a relevant  
150 a priori framework against which the reviewed infor-  
151 mation is coded and synthesized against), and has  
152 gained popularity in health services research, essen-  
153 tially due the theoretical soundness, feasibility, and  
154 the relative simplicity of the approach and its inter-  
155 pretation [40, 41, 44, 45]. More specifically in the  
156 knowledge translation and implementation science  
157 fields, there is a proliferation of frameworks, either  
158 emergent or established [46, 47], one could select to  
159 use as a guide for data synthesis. For this study, we  
160 have selected the Consolidated Framework for Imple-  
161 mentation Research (CFIR) based on its widespread  
162 in the field of Implementation Science [48, 49] and  
163 its use for similar studies [31].

164 This review protocol was prepared using the Pre-  
165 ferred Reporting Items for Systematic Reviews and  
166 Meta-Analyses Protocol (PRISMA-P) guidelines and  
167 the PRISMA-P checklist. The protocol was submit-

168 ted for registration on the International Prospective  
169 Register of Systematic Reviews (PROSPERO) and  
170 assigned registration number CRD42021253927.

## 2.1. Data sources and search strategy

171  
172 Six databases for the scientific, peer-reviewed  
173 literature (MEDLINE/PubMed, EMBASE, Scopus,  
174 CINAHL, PEDro, OTseeker) will be searched. No  
175 date restrictions apply, and an update of the search  
176 will be performed after the data extraction has been  
177 completed.

178 The Appendix details the search strategy for  
179 PubMed/MEDLINE. The strategy combines search  
180 terms related to 1) telehealth, 2) implementation, 3)  
181 publication types or study designs, and 4) rehabilita-  
182 tion. The latter was based on a previously published  
183 search filter for locating rehabilitation content in  
184 PubMed, with a focus on Medical Subject Headings  
185 (MeSH) [50]. Indeed, the strategy uses both indexed  
186 MeSH terms and key free-text keywords as alterna-  
187 tive to one another for a more comprehensive search.  
188 The search strategy in PubMed/MEDLINE was  
189 reviewed using the Peer Review for Electronic Search  
190 Strategies (PRESS) template [51], and will be applied  
191 to the searches in other databases. Secondary searches  
192 using snowballing strategies (e.g., consulting ref-  
193 erences lists of included articles, citation-tracking,  
194 author-tracking, search of the review authors’ per-  
195 sonal libraries) will also be used to identify any  
196 additional articles. Furthermore, we will also include,  
197 in our screening process, the list of papers from any  
198 other recent reviews (e.g., recently published review  
199 of telerehabilitation implementation that described  
200 themes and theories in studies related to the users’  
201 adoption or satisfaction with telerehabilitation tech-  
202 nologies [7]). As we will only include research-based,  
203 empirical papers, we will not search for the grey lit-  
204 erature.

205 Members of Dissemination & Implementation  
206 Research Task Force of the Health Services Research  
207 Networking Group of the American Congress of  
208 Rehabilitation Medicine will serve as “key infor-  
209 mants”. They will be provided a preliminary list of  
210 included references and asked to supply any addi-  
211 tional references, pertaining to the eligibility criteria,  
212 that we may have missed or could not identify (e.g.,  
213 with no direct link to the issues reviewed in the titles  
214 or abstracts). Any of these papers will undergo full-  
text review against the eligibility criteria.

## 2.2. Study eligibility criteria

We will include empirical research worldwide addressing the clinical use or implementation of telehealth in physical rehabilitation services or by physical rehabilitation professionals, from a range of study designs. These include the full range of quantitative, qualitative, and mixed-methods original research, exclusive of case studies, case reports, and qualitative studies with  $n < 5$ . We will only include papers with study results, not study protocols per se. Systematic reviews can be included, no other forms of review. We limit the review to papers reported in English as we aim to focus on the literature reported to an international audience. We have no a priori restrictions on publication dates for the inclusion of papers, although a temporal cut-off can be applied later in the synthesis stage, with a given rationale, when all the *corpus* of the review is known. These iterative decisions are common in configurative type of reviews, when the topic is complex and uncharted [52, 53].

### 2.2.1. Population

Our population of interest includes both the care providers and the recipients of that care. The providers are physical rehabilitation professionals and their teams, which include but are not limited to physical therapists, occupational therapists, rehabilitation-specialist physicians, rehabilitation-specialist nurses, chiropractors, speech and language pathologists, orthotic & prosthetic professionals, osteopathic medicine practitioners, and community-based rehabilitation workers. These professionals typically work in rehabilitative settings, but they may also have preventive roles (e.g., primary, secondary, or tertiary prevention). Hence, they may work at multiple levels of clinical care ranging from primary health care, to acute, post-acute and rehabilitative, palliative or long-term care, or even outside of the rehabilitation health care sector (e.g., school-based occupational therapists), as long as the care is delivered by a rehabilitation professional and is directed toward people with physical impairments or disabilities.

For the context of this study, the recipients of care are people with physical impairments or disabilities, i.e., those experiencing, at any point across the lifespan, long- or short-term impairments affecting mobility functions, among others, and subsequently the performance of daily activities or social participation. The recipients of care also may include persons at high risk of acquiring physical impairment or disability (e.g., high risk of falls) [54–56]. The working

definition does not include impairments arising from oral, intellectual, cognitive (e.g. dementia), sensorial, or mental health conditions per se; however, for example, the rehabilitation of cognitive, communicative, and neuro-behavioural impairments as a result of or associated to physical impairments (e.g. arising from stroke, traumatic brain injuries) are included in the scope of rehabilitation covered [50]. Care recipients can also include family members or informal caregivers of people undergoing telerehabilitation, provided they are also subjects of the care delivery by telerehabilitation means or are active assistants in the delivery of telerehabilitation care to the patient.

Apart from physical rehabilitation professionals, we also include physical rehabilitation services of settings as a whole structure, which include for example inpatient rehabilitation facilities or units, skilled nursing or long-term care facilities, outpatient services, and home- or community-based services - all with a focus on physical rehabilitation.

### 2.2.2. Intervention

With a focus on physical rehabilitation professionals or services, the intervention includes the use of any telehealth technology. Telehealth is a general term as a service delivery model that uses any information and communication technology (e.g. cell or smartphones, tablets, computers, mobile applications) to deliver health- and rehabilitation-related services when the client is at a distance from the practitioner, i.e. remotely delivered [1, 2]. This includes synchronous delivery of health services via remote telecommunications, interactive consultative and diagnostic / evaluation services offsite, as well as asynchronous forms of service delivery. Use of telematic mechanism not directly implying the delivery of care (e.g., online patient satisfaction surveys, use of mobile applications for billing purposes or scheduling appointments) will not be considered as telehealth interventions. Virtual reality, robotic or other electronic-based approaches to rehabilitation are only considered if delivered remotely and with direct involvement of a physical rehabilitation professional guiding its use.

We will also include implementation interventions for the use of telehealth technologies in the field of physical rehabilitation or by physical rehabilitation professionals. Implementation interventions refers to any systematic activities aimed to achieve the adoption and integration of evidence-based practices, policies, or innovative technologies - here telehealth technologies - into routine health care. In

316 this review, this will be inclusive of activities for  
 317 the use, diffusion, adoption, and spread of the use  
 318 of telerehabilitation approaches across geographies,  
 319 settings, organizations, sectors or units of an orga-  
 320 nization. It will be also inclusive of the activities  
 321 envisioning the sustainability of the use of a telehealth  
 322 technology. Finally, the construct will be inclusive  
 323 of the activities toward building an infrastructure or  
 324 broader capacity for implementing or scaling up the  
 325 use of a telehealth technology for physical rehabil-  
 326 itation. Related to our second study question (i.e.  
 327 how prevalent is the use of telehealth technologies  
 328 by physical rehabilitation providers and/or services  
 329 into routine practice), we will include studies on the  
 330 use of telerehabilitation approaches in routine care  
 331 (i.e., non-experimental context), or pragmatic stud-  
 332 ies on the effectiveness or comparative effectiveness  
 333 of telerehabilitation approaches, which by definition  
 334 would reflect the conditions of routine care. Studies  
 335 examining feasibility or efficacy of a new approach  
 336 / technology for provision of telehealth by rehabili-  
 337 tation providers and/or for rehabilitation services are  
 338 considered experimental conditions, i.e. not routine  
 339 care; therefore, these studies are excluded.

### 340 2.2.3. Comparators

341 For the use of telehealth interventions, the explicit  
 342 or implicit comparator is the care delivered in person  
 343 in a physical rehabilitation setting or by physical reha-  
 344 bilitation professionals. Whenever a study compares  
 345 different approaches to an implementation interven-  
 346 tion or increasing the use of telehealth technologies  
 347 for physical rehabilitation, this will be an analytical  
 348 point of interest. However, there is no requirement of  
 349 an explicit use of a comparator for any study to be  
 350 included.

### 351 2.2.4. Outcomes

352 The outcomes of this review reflect the study ques-  
 353 tions, and they are not necessarily hierarchical (i.e.,  
 354 primary or secondary), but different in scope. With  
 355 a focus on physical rehabilitation services or profes-  
 356 sionals, here the outcomes refer to the use or rate of  
 357 use and implementation of telehealth technologies in  
 358 routine practice or any indicators of the effectiveness  
 359 of implementation endeavours in terms of providers'  
 360 uptake or use of telehealth technologies.

361 Apart from the outcomes (i.e., endpoints), the  
 362 review is focused on the factors (i.e., variables)  
 363 influencing the use or implementation of telehealth  
 364 technologies. These variables can be determinant,  
 365 mediating, or moderating variables acting as barriers

or facilitators to the use or implementation outcomes.  
 As possible variables, we will consider those articu-  
 lated by the implementation model that will guide the  
 data extraction and synthesis of the results.

### 370 2.3. Data management

371 Records arising from scientific databases and the  
 372 preprint server will be exported to a commercial  
 373 references manager software (EndNote, Clarivate  
 374 Analytics), where duplicates will be removed. After  
 375 that, records will be transferred to the COVIDENCE  
 376 software for the screening and the data extraction  
 377 process.

### 378 2.4. Screenings

379 Two independent reviewers will conduct the  
 380 screenings against the eligibility criteria, after a pilot  
 381 screening in at least 5% of the records at every screen-  
 382 ing level, with any subsequent readjustment or further  
 383 training as needed. For the Level 1 screening (titles  
 384 and abstract screening), HH, TJ, and SB will perform  
 385 the independent reviewer's role, notably HH and TJ  
 386 will perform the role of the reviewer number 1 and  
 387 SB the reviewer number 2. The reviewers will try to  
 388 reach consensus on the disagreements, while TJ or  
 389 HH (the one not performing the Level 1 screening)  
 390 would make the final decision about whether or not  
 391 to retaining if disagreements cannot be resolved by  
 392 the two Level 1 reviewers. For the Level 2 screening  
 393 (final eligibility decision based on full-text review),  
 394 HH will perform the first independent's reviewer role,  
 395 and SK and SB will split the second reviewer role. If  
 396 disagreements are not resolved by consensus, TJ will  
 397 make final eligibility decisions.

### 398 2.5. Quality assessment

399 Each publication finally selected through the Level  
 400 2 screening will be appraised for methodological  
 401 quality. We will use the tools appropriate for the study  
 402 design, as assigned by HH (consulting other research  
 403 authors as needed), from the entire portfolio of the  
 404 Joanne Briggs Institute's critical appraisal tools [57].

405 Specifically, according to the study designs possi-  
 406 ble included, the following checklists:

- 407 ● Checklist for Analytical Cross-sectional Stud-  
 408 ies;
- 409 ● Checklist for Case Control Studies;
- 410 ● Checklist for Cohort Studies;

- 411 • Checklist for Economic Evaluations;
- 412 • Checklist for Qualitative Research;
- 413 • Checklist for Quasi-Experimental Studies (non-
- 414 randomized experimental studies)
- 415 • Checklist for Randomized Controlled Trials

416 Two independent reviewers, i.e., those that will  
 417 have data extraction tasks under the same schema,  
 418 will apply and fill in the respective checklists, appropri-  
 419 ate for the study design. Within that process, at the  
 420 end of the critical appraisal, each reviewer will pre-  
 421 liminarily recommend the “inclusion”, “exclusion”  
 422 or the option to “seek further information”, accord-  
 423 ing to the methods quality. Whenever required, we  
 424 (through SK) will attempt to contact study authors  
 425 for unreported data or clarification of study meth-  
 426 ods using no more than two e-mails. If data remains  
 427 unavailable, we will analyse the available data and  
 428 report the potential impact of missing data in the  
 429 discussion section. After their independent ratings,  
 430 reviewers will discuss any divergent ratings toward  
 431 consensus on the final eligibility based on the assess-  
 432 ment of methods quality, involving a third reviewer  
 433 (TJ) when necessary.

434 As typical in configurative, exploratory, or mixed-  
 435 methods review, only those papers ‘fatally flawed’,  
 436 i.e. with substantial methodological shortcomings  
 437 will be excluded during this procedure [42, 52]. If  
 438 included, evidence coming from a paper with rele-  
 439 vant methodological shortcomings will be signalled  
 440 as such in the paper’s final report, with the narrative  
 441 description of the shortcomings. No formal grading  
 442 will be applied within studies of the same method-  
 443 ological type, and no formal hierarchy will be applied  
 444 across study types or coming from different episte-  
 445 mologies.

## 446 2.6. Data extraction

447 Using a data extraction form and structure con-  
 448 structed by the research team, formal data elements  
 449 (e.g., publication and study type, service con-  
 450 texts addressed, professionals involved, geographies  
 451 addressed) will be extracted and categorized by one  
 452 of the research authors (SB), with a random sample  
 453 of 10% verified by another (SK). This will follow  
 454 a pre-determined coding structure elaborated by the  
 455 research team. Formal citation elements (publication  
 456 year, journal, keywords, language) will be directly  
 457 exported from EndNote. The conjunct of these ele-  
 458 ments will be instrumental to answer to the first study  
 459 question.

460 Two independent reviewers (SB and SK) will  
 461 extract any quantitative data on the use or on the  
 462 implementation of telehealth technologies, in addi-  
 463 tion to synthesizing the methodologies used to obtain  
 464 that data. Additionally, the same reviewers will  
 465 extract text quotations on any methodologies that  
 466 were used to facilitate the implementation, adoption,  
 467 and sustainment of telehealth technologies among  
 468 rehabilitation providers and/or services. These data  
 469 will be instrumental to answer to the second and third  
 470 study questions.

471 Finally, for the variables that influence the use of  
 472 telehealth technologies or the effectiveness of related  
 473 implementation endeavours, the data extraction will  
 474 be performed independently by two reviewers (SB  
 475 and SK), and depicted in a table that will reflect the  
 476 major constructs of an implementation framework,  
 477 selected a priori (see data synthesis).

## 478 2.7. Data synthesis

479 Descriptive statistics will be used to respond to  
 480 the first study question: i.e., synthesise how large  
 481 and of which type is the empirical literature on the  
 482 use or implementation of telehealth technologies. A  
 483 narrative description will be used to respond to the  
 484 second and third study questions, even when quanti-  
 485 tative data is involved. It is unlikely that data can be  
 486 aggregated given the probably heterogenic popula-  
 487 tions and methods. This is aligned with a convergent  
 488 synthesis approach selected for this mixed-methods  
 489 systematic review [34, 39].

490 Finally, as noted at the beginning of the meth-  
 491 ods section, a “framework synthesis” approach will  
 492 be applied to address the fourth study question, on  
 493 the factors influencing the use or implementation of  
 494 telehealth approaches.

495 Among several implementation models avail-  
 496 able [46, 47, 58], many of which with limited  
 497 use [47], we selected the Consolidated Framework  
 498 for Implementation Research (CFIR) [48, 49, 59].  
 499 This meta-theoretical framework, which provides  
 500 a repository of standardized implementation-related  
 501 constructs and is focused on its determinants, has  
 502 been applied extensively in the health care field,  
 503 inclusively for synthesising data on rehabilitation top-  
 504 ics [31, 60–62]. The CFIR comprises 39 constructs  
 505 organized across five major domains, all of which  
 506 interact to influence implementation and implemen-  
 507 tation effectiveness [63].

508 Other implementation frameworks could be rele-  
 509 vant, such as the Theoretical Domains Framework

(TDF) [48, 64], the Normalization Process Model (NPM) [65], The Promoting Action on Research Implementation in Health Services (PARIHS) framework [66], the nonadoption, abandonment, scale-up, spread, and sustainability (NASS) framework [67, 68] and Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM) [69], which has a greater focus on the evaluation of implementation activities. Sometimes, combinations of frameworks have been used to study implementation topics, such as the combined use of the CFIR with the TDF [48]. The CFIR and the TDF are both well-operationalized, multi-level implementation determinant frameworks derived from theory. While both address collective (e.g., organizational) and individual level determinants of implementation, the TDF has a greater focus at the individual level as well as on psychological, behavioural change theory. In turn, the CFIR addressed both individual and collective factors, but with a greater focus on the latter. The combined use of the CFIR and TDF often threaten parsimony [48], and for the context of this study we emphasize an interest in collective (e.g. organizational) factors first.

Alongside with the data extraction, two independent reviewers (SK and SB) will categorize the extracted information on the variables (e.g., determinants, moderators, mediators) reported as affecting or likely affecting the use or implementation of telehealth technologies in rehabilitation contexts. The five major domains of the CFIR will be used for that categorization. Then, another reviewer, with experience in both health services and tele-rehabilitation research (HH), will merge and eventually refine the categorization, using more granular classification levels of the CFIR as may be useful, consulting with any of the independent data extractors and other research authors (e.g., JPB, TJ, KJ) as needed. The whole research team will approve any temporal cut-off for the final inclusion of papers and the final synthesis, which will have a configurative rather than aggregative nature. In this way, within a summary table, we will provide a brief narrative reporting of the methods leading to the results for each component or sub-component under analysis. As such, there will be no aggregative measurement, formal assessment of heterogeneity or publication bias, or the selection unit of analysis (e.g., individual participants vs aggregated data from each study) for the any of the data. Also, as noted before, there will be no formal grading or other formal assessment of the confidence in the evidence reported.

Depending on the which type of data arises from the reviewed studies, subgroup analyses can be performed based on health conditions, sectors, service levels, and geographies as well as technology type (e.g., smartphones, mobile applications). Similarly, depending on the type of studies included for addressing each study question, sensitivity analysis can be performed regarding for example the inclusion of only experimental or only controlled experimental designs, as a means to detect any change in the pattern of the configurative results.

A first complete draft with the study results will be developed by the primary reviewers (HH, SK, SB) but iteratively edited by the other research authors (TJ, JPB, KJ). This whole process, developed against the data extraction tables, may require reconfigurations in the framework synthesis (reallocation of content per categories), revisiting the raw material for new or additional information, and the determination of categories for which data could not be obtained. A full manuscript draft, with discussion and implications (e.g. on future research to close any identified gaps) will be shared, by the last, with our key informants (i.e., from the Dissemination & Implementation Research Task Force of the Health Services Research Networking Group of the American Congress of Rehabilitation Medicine) for any feedback or improvement suggestions.

### 3. Dissemination plan

The final review results will be submitted to publication into a peer-review journal in the rehabilitation, telehealth, or implementation science fields. Further dissemination will occur through the Dissemination & Implementation Research Task Force and the broader Health Services Research Networking Group of the American Congress of Rehabilitation Medicine, including through their own communication channels. Other dissemination strategies may an oral presentation at the American Congress of Rehabilitation Medicine's major conference.

### 4. Conclusion

This study protocol for a mixed-methods systematic review aims to map and synthesis on the use or factors affecting the implementation of telerehabilitation approaches, in order to inform further



implementation endeavours or research. The main limitation of this review is that it focuses exclusively on English-language empirical literature.

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927 **Appendix: Search strategy for**  
 928 **PubMed/MEDLINE**

929 (“Telemedicine”[Mesh] OR “Telerehabilita-  
 930 tion”[Mesh] OR “Mobile Applications”[Mesh]  
 931 OR “Biomedical Technology”[Mesh] OR “Smart-  
 932 phone”[Mesh] OR “Cell Phone”[Mesh] OR  
 933 “telerehab\*”[tw] OR “tele-rehab\*”[tw] OR  
 934 “telehealth\*”[tw] OR “tele-health\*”[tw]) AND  
 935 (“Diffusion of Innovation”[Mesh] OR “Tech-  
 936 nology Transfer”[Mesh] OR “Implementation  
 937 Science”[Mesh] OR “Health Plan Imple-  
 938 mentation”[Mesh] OR “implement\*”[tw] OR  
 939 “uptake”[tw]) AND (“Clinical Trial” [Publication  
 940 Type] OR “Observational Study” [Publication  
 941 Type] OR “Evaluation Study” [Publication Type]  
 942 OR “Comparative Study” [Publication Type]  
 943 OR “Multicenter Study” [Publication Type] OR  
 944 “Feasibility Studies”[Mesh] OR “Controlled Before-  
 945 After Studies”[Mesh] OR “Pilot Projects”[Mesh]  
 946 OR “Cohort Studies”[Mesh] OR “Case-Control  
 947 Studies”[Mesh] OR “Historically Controlled  
 948 Study”[Mesh] OR “Interrupted Time Series Anal-  
 949 ysis”[Mesh] OR “Cross-Sectional Studies”[Mesh]  
 950 OR “Focus Groups”[Mesh] OR “Qualitative  
 951 Research”[Mesh] OR “Grounded Theory”[Mesh]  
 952 OR “process evaluation”[tw] OR “formative evalu-  
 953 ation”[tw] OR “summative evaluation”[tw]) AND  
 954 (“rehabilitation”[Subheading] OR “Rehabilita-  
 955 tion”[MeSH] OR “Recovery of Function”[Majr]  
 956 OR “Physical Therapy Specialty”[Major] OR  
 “Physical Therapy Modalities”[Major] OR “Phys-

ical Therapy Department, Hospital”[Major] OR  
 “Hospitals, Rehabilitation”[Major] OR “Physical  
 Therapist Assistants”[Major] OR “Physical Ther-  
 apists”[Major] OR “Physical and Rehabilitation  
 Medicine”[Major] OR “Rehabilitation Nurs-  
 ing”[Major] OR “Occupational Therapists”[Major]  
 OR “Occupational Therapy Department, Hospi-  
 tal”[Major] OR “Occupational Therapy”[Major]  
 OR “Speech-Language Pathology”[Major] OR  
 “Activities of Daily Living”[Major] OR “Self-Help  
 Devices”[Major] OR “Exoskeleton Device”[Major]  
 OR “Artificial Limbs”[Major] OR “Orthotic  
 Devices”[Major] OR “Canes”[Major] OR  
 “Walkers”[Major] OR “Crutches”[Major] OR  
 “Rehabilitation Centers”[Major] OR “Rehabilitation  
 Research”[Major] NOT “Correction of Hear-  
 ing Impairment”[Mesh] NOT “Substance Abuse  
 Treatment Centers”[Mesh] NOT “Mouth Rehabilita-  
 tion”[Mesh] NOT “Mental Disorders”[Mesh] NOT  
 “United States Substance Abuse and Mental Health  
 Services Administration”[Mesh] NOT “National  
 Institute of Mental Health (U.S.)”[Mesh] NOT  
 “Mental Health Services”[Mesh] NOT “Mental  
 Health Associations”[Mesh] NOT “Community  
 Mental Health Services”[Mesh] NOT “Community  
 Mental Health Centers”[Mesh] NOT “Reha-  
 bilitation, Vocational”[Mesh] NOT “Sheltered  
 Workshops”[Mesh] NOT “Psychiatric Nurs-  
 ing”[Mesh] NOT “Mental Health Recovery”[Mesh]  
 NOT “Psychiatric Rehabilitation”[Mesh]) AND  
 (“English”[language]).

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