

## Clinical Pain Research

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# Hurdles and potentials when implementing internet-delivered Acceptance and commitment therapy for chronic pain: a retrospective appraisal using the Quality implementation framework

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**Abstract**

**Objectives:** Internet-delivered psychological interventions can be regarded as evidence-based practices and have been implemented in psychiatric and somatic care at primary and specialist levels. However, challenges as low adherence and poor routinization, have arisen during attempts to implement internet-delivered interventions in chronic pain settings. Internet-delivered Acceptance and Commitment Therapy (IACT) has been found to be helpful for chronic pain patients and might aid in developing pain rehabilitation services. However, the integration of IACT into standard health care has not yet been described from an implementation science perspective. The aim of this hybrid 1 effectiveness-implementation study was to evaluate the process of implementing IACT in a pain rehabilitation setting, to guide future implementation initiatives.

**Methods:** In this retrospective study we described actions taken during an implementation initiative, in which IACT was delivered as part of an interdisciplinary pain rehabilitation program (IPRP) at a specialist level clinic. All documents relevant to the study were reviewed and coded using the Quality Improvement Framework (QIF), focusing on adoption, appropriateness and sustainability.

**Results:** The QIF-analysis of implementation actions resulted in two categories: facilitators and challenges for

implementation. Sustainability may be facilitated by sensitivity to the changing needs of a clinical setting and challenged by unfitting capacity building. Appropriateness might be challenged by an insufficient needs assessment and facilitated by aligning routines for communication with the clinic's existing infrastructure. Adoption may be facilitated by staff key champions and an ability to adapt to occurring hurdles. Possible influential factors, hypotheses and key process challenges are presented in a logic model to guide future initiatives.

**Conclusions:** Sustainable implementation may depend on both the continuity of facilitating implementation actions and flexibility to the changing needs and interests of patients, caregivers and organization. We conclude that the use of theories, models and frameworks (TMF) as well as a logic model may ease design, planning and evaluation of an implementation process. Lastly, we suggest that IACT may be appropriate for IPRP when given before or after IPRP, focusing on psychiatric comorbidities.

**Keywords:** chronic pain; internet-delivered acceptance and commitment therapy; quality implementation framework; interdisciplinary pain rehabilitation pain program; logic model; TMF

## Introduction

The utility of and need for internet-delivered health care has become apparent during the covid-19 pandemic [1]. Internet-delivered psychological interventions have been implemented in somatic and psychiatric care in many places in the world [2]. Internet-delivered interventions can be regarded as an evidence-based treatment alternative that enables patients to access qualified remote home-based care at a time that suits them [3, 4].

Internet-delivered acceptance and commitment therapy (IACT) is a novel psychological intervention that has shown small to large effect sizes on pain-related outcomes such as

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disability, pain intensity, and pain interference and on psychological outcomes such as acceptance, anxiety, depression, catastrophizing, and fear-avoidance at post treatment and at follow-up [5]. ACT builds on cognitive behavioral therapy and targets experiential learning and different facets of psychological flexibility [6]. ACT focuses on the function of pain behavior within its specific context [7]. The theoretical underpinnings of ACT are operant behavioural theory [8] and relational frame theory [9]. Psychological treatments delivered via the internet are most often characterized by high-quality treatment content provided through text and sometimes audio on a weekly basis along with home-work assignments, which an e-therapist will read and feedback [10].

The transdiagnostic approach in ACT together with its focus on function, flexibility, and adaptive behavior patterns is helpful in rehabilitation for chronic pain, to enhance resilience and autonomy [11]. Also, the emphasis on home-work, daily practice, and experiential learning from real-life experiences [6] makes ACT suitable as a guided self-help intervention delivered via the internet. So far, IACT for chronic pain has been tested both as standalone treatment [12, 13] and blended care [14]. It has been given as part of site-based rehabilitation [15], after routine care as aftercare program [16] and as booster intervention [17]. Moreover, interventions have been offered to persons recruited from the general population [18] and in specialist clinics [17].

Reports from mature clinics with years of experience of integrating internet-delivered interventions in clinical practice, have highlighted contextual consideration as evident to move from local projects to sustainable integration [19]. These process evaluations have resulted in guidelines emphasizing appropriate governance to ensure maintenance of safe and high-quality interventions [20] and built-in routines for referrals and alignments with other health services [19]. Furthermore, routines for looping feedback to the organization and collaboration with universities for training and supervision for e-therapists, have eased sustained use [21]. Studies of the implementation of novel treatments, have also outlined benefits of internet-delivered interventions from a societal perspective, as reduced waiting lists and improved care for patients in need of face-to-face treatment [22]. Also, qualitative studies of the experiences of ICBT clinicians add to research on treatment development, as recurring hurdles as uptake, adherence, fidelity and cost, are enlightened when taking different stakeholders' perspectives and contextual factors into account [22]. Hence, the potential contribution of applying implementation science to the field of treatment development are multiple.

Implementation studies performed in routine health care are called for as the next step to move research forward

[2] both on internet-delivered cognitive behavioral therapy (ICBT) in general [23] and on IACT for chronic pain in particular [24]. There is a discrepancy between number of systematic reviews of the efficacy of IACT for chronic pain [4, 05, 25–33] and the number of reports of how to integrate IACT in clinical practice [34]. Therefore, challenges relating to sustained implementation warrant further attention.

Initiatives to add ICBT and IACT to pain rehabilitation in standard clinical practice have so far described alignment with clinical practice [35, 36] and treatment adherence [15, 34] as potential hurdles. One possible barrier for the integration of internet-delivered interventions in specialist level pain management services as Interdisciplinary Pain Rehabilitation Programs (IPRPs) may be the complex format of such pain management programs [37], which may complicate adoption of novel interventions. Multiple caregivers offer synchronized multimodal interventions to a group of patients following a comprehensive program running for several weeks; compared to the more straightforward setup where one e-therapist gives a protocol-based treatment for one disorder to one patient at a time in psychiatric care. A second possible explanation for the slow transition may be the varying needs and expectations of chronic pain patients [38], and the appropriateness of a structured guided internet-delivered self-help program.

Interdisciplinary Pain Rehabilitation Programs (IPRP) are however, regularly updated based on new evidence for efficient treatments. Most often, these organizational changes are not evaluated from a contextual perspective, but rather tested from a patient's point of view, using profession-specific methods to measure improved functioning or symptom deterioration. It does happen though, that implementation theory, model or framework (TMF:s) [39, 40] are applied when novel interventions are added to existing pain treatments for example, Emancipatory Action Research was used when ACT was implemented in a physiotherapy-led pain rehabilitation program [41]. The study outlined both hurdles and potentials to embed ACT, such as the need to reconstruct the ACT-concept acceptance and how to use the ACT-concept values to create motivation [41].

One benefit of applying implementation science to treatments development, is the variety of analyses and measurements and hence implementation outcomes to use, depending on the stage of implementation [42]. The earlier stage of implementation, the more common it is to collect data from individual providers or consumers, meanwhile the later stages of implementation may require data collected from the organization or setting to answer the research question. However, a unique contribution from implementation science is its potential to study contextual influence on outcome. For example, a novel intervention

may be found acceptable to patients, appropriate to providers and feasible in terms of symptom deterioration in efficacy studies. However, when added to a clinical setting it may not be appropriate to the organization's vision, adoptable in the specific setting or maintainable due funding structure.

So far, several implementation outcomes have been studied using quantitative and qualitative research and implementation research specifically. Chronic pain patients have perceived digital interventions as agreeable, acceptable, and potentially helpful [43]. Several efficacy studies suggest that internet-delivered interventions may help chronic pain patients with pain interference, catastrophizing, and psychological functioning [26]. The acceptability among health professionals has been found to be low-to-moderate, although possibly influencing uptake and adherence negatively [44]. Attrition [15] and low uptake [24] have hampered clinical trials and may warrant further attention to move implementation of IACT forward.

Challenges to adopt IACT in pain clinic settings may be due to the interdisciplinary context of pain management services. Adherence to treatment protocols has been found to be higher among other patient groups (e.g., tinnitus), which proposes that the group based and interdisciplinary milieu of IPRP may warrant further adoption of IACT to better fit the setting. Chronic pain patients have however found IACT satisfactory, appropriate [38] and helpful [16]. Concerning fidelity, three elements have been described as crucial for chronic pain patients' self-management, namely eliciting self-efficacy, self-discovery and a supportive ambience [45]. In wider research, patient motivation, ability and symptom profile have been suggested to effect adherence to ICBT [36]. Lastly, costs of implementation and spread of ICBT/IACT in chronic pain settings are less studied. Wider research and preliminary findings have however showed potential cost benefits [46, 47]. Studies of sustained use and routinization of IACT for chronic pain is however still in its early stages [4, 34].

Too speed up research in clinical settings, data on the implementation process may be collected simultaneously to data on the effectiveness of the intervention, also called hybrid effectiveness-implementation studies [48]. This design allows for gathering data from both patients and context. Efficacy trials speak for the feasibility of IACT for chronic pain and qualitative research has found IACT acceptable to providers [24] and appropriate to patients [38]. A contextual perspective might, however, enlighten the observed difficulties with spread and routinization [35, 36] to clinical services. Hence, the present study focuses on the appropriateness of IACT in routine IPRP from a contextual perspective.

The aim of this retrospective appraisal of a hybrid 1 effectiveness-implementation study [48] of IACT for chronic pain in public health service was to evaluate what implementation actions were used and evaluate their influence on the implementation process. The purpose and desired impact of the study was to guide future implementation initiatives to sustainably integrate IACT in IPRP settings. Our hypothesis was that a focus on adoption and appropriateness from a contextual perspective would ease development of an implementation logic.

## Materials and methods

### Implementation outcomes

This study retrospectively described the actions taken during an initial implementation initiative, in the purpose to develop a logic model to guide future implementations. The implementation outcome in focus was primarily appropriateness. Appropriateness refers to the perceived compatibility of a treatment to a setting [42], in this study the compatibility of IACT for chronic pain as an add on treatment to IPRP at specialist level. Different facets of appropriateness were of interest, such as suitability, usefulness and practicability. Also, certain aspects of adoption were of interest, such as utilization and intention to try. Adoption refers to the intention to employ an evidence-based practice [42], in this study implementation actions that showed the organization's interest in adopting IACT as addition to IPRP. Lastly, actions relating to sustainability were found in the data as it was compared to the emerging literature on implementation of internet-delivered interventions in regular health care. Sustainability refers to the maintenance of a novel intervention [42], in this study actions that have potential to aid the incorporation of IACT in an IPRP setting.

### Design

Hybrid 1 trials are recommended when there is strong evidence to support the applicability of an intervention in a setting, although more knowledge of the implementation process is needed to address implementation research questions more accurately [48]. Valuable information may then be gathered in the purpose to better the fit of the intervention and the implementation logic for subsequent trials. Collected data should target facilitators, barriers, translation problems, promising implementation strategies and potential modification. In this hybrid 1 effectiveness-implementation study [48], IACT was implemented in a specialty care setting. In addition to evaluating the effects of the intervention which has been published [15], data from the implementation process were evaluated retrospectively using a deductive approach in line with the Quality Implementation Framework (QIF) [49].

In a hybrid 1 trial [48] the primary goal is to test the effectiveness of an intervention. The secondary aim is to gain knowledge of contextual factors that may influence the implementation process to learn if a particular intervention is suitable in a certain context or for a certain patient group. Even though determining the effectiveness of the intervention is in focus, data on the implementation process is still collected as the trial runs. However, the data is usually not summarized and

analyzed until the end of the trial [50, 51]. One challenge with this process is memory loss in cases of interviews, or failure to realize what data should be stored for later processing. However, an advantage with retrospective appraisals is that data from the start of the implementation process to the end may be evaluated taken together. Also, it is more likely that the effect of strategies from the earliest phases of the implementation process becomes apparent, if the appraisal covers the complete implementation time, compared to evaluating the process as it occurs.

## Implementation model

Of the eligible TMF:s, QIF [49] was chosen, primarily because of its applicability and usability for describing actions taken when implementing a novel intervention in a fixed context. Evaluated by T-Cast – a tool to compare and select a suitable TMF – [52] the QIF was found to address the relevant analytical levels (individual consumer, individual provider, care team, organization), provide a sequential approach and cover important constructs. The QIF also includes procedures for practical implementation. Most importantly, it illustrates how actions in different steps of implementation influence each other, for example how the initial analyses affect decision making processes later on. The QIF has previously been applied to detect potentials and hurdles for sustained implementation [53]. It has also been helpful in retrospective evaluations when a novel interventions was implemented in a specific setting [54].

QIF is the result of an extensive merge of 25 implementation frameworks from several research areas, focusing on common crucial steps for implementation [49]. QIF is structured in four sequential phases and implies which practical actions need to be taken in each step. It has so far been applied in diverse settings, both when planning implementation [55] and evaluating an implementation process [51]. The first phase of QIF concerns initial considerations regarding the host setting and conveys eight strategies for assessment, adaption, and capacity-building. The second phase includes two strategies to create a structure for implementation. The third phase contains three strategies for ongoing structure once implementation begins. The final fourth phase focuses on improving future initiatives. However, the evolvement and adaption of actions may continue throughout the process and are not bound to its respective phase. Also, contextual factors may influence how and when in the process the steps are practiced and emphasized.

## Implementation setting

In a specialist level clinic, chronic pain patients were randomized to a 6-week IPRP either with or without the addition of IACT. Results showed medium to large between group effect sizes on pain acceptance, psychological inflexibility, affective distress, and self-efficacy for the group who received IACT in addition to IPRP. However, large missing data, high dropout rates and heterogenous data complicated interpretation of the results [15]. It was concluded that IACT may enhance the effect of IPRP on psychological outcomes, although future studies on contextual features of IPRP were suggested to shed light on implementation hurdles as attrition.

## Implementation object

The implemented object was a web site providing psychological interventions, information on rehabilitation and means to communicate

with an e-therapist. The platform behind the website was designed and developed by two software engineers. Two psychologists with previous experience of ICBT and IACT [38, 56, 57] wrote the specification. For technical details on code, storage, and database, please see Supplementary material.

## Intervention

The content on the web page was updated weekly and built on to what patients were presented during a 6 week long IPRP on site. The material was altogether ACT based, including audio recorded mindfulness and experiential exercises, along with educational texts on chronic pain and self-management. The web site also presented an exercise diary, forms for evaluating behavior change and audio recordings of physiotherapy interventions. The 11 week long aftercare part, given after the end of the IPRP, continued with psychoeducational texts, means to continuously plan and evaluate behavior change along with mindfulness and experiential exercises. Congruent with content earlier presented during the IPRP, the web page also contained insomnia interventions and texts with exercises based on occupational therapy and physiotherapy. The rationale for the design was to provide opportunities for patients to practice rehabilitation activities in between sessions and after the end of the IPRP, in their home-setting. The aim of the RCT was to study the effectiveness of IACT when added during and after an IPRP for chronic pain patients in specialist care [15].

## Analysis

All eligible project documents, digital or hand-written, were collected by the first author in collaboration with the project team members. The documents consisted of reports, applications, communication with stakeholders, in-house evaluations, planning document and notes taken at team and unit meetings (see footnotes in Table 1).

All documents were initially scanned to assess whether they conveyed information on QIF implementation strategies, see Figure 1. All official documents, as reports and applications were deemed informative. Following discussions in the research team most of the hand-written notes were not considered informative but are kept for potential later analyses. The next step was a more thorough review of the remaining documents with one QIF-phase in mind at a time, in consecutive order. Information explicitly or inexplicitly described, or not at all found, based on the fourteen QIF-steps were summarized in a table during the read-through, see Table 1.

When all documents had been screened for data concerning all 14 QIF-steps, the data was summarized for each of the four phases; (1) initial consideration, (2) creating a structure, (3) ongoing strategies, (4) learning, see the Results section. This summary describes which implementation actions that were or were not described in the documents.

Thereafter, patterns of behaviors, reasons for decisions made and possible explanations to actions taken or non-taken were checked. Differences in actions during the four phases were sought for. Also, links between actions in the four QIF-phases were looked for from a time-perspective, to see if early actions affected later ones. This evaluation resulted in grouping of data into two categories; implementation actions that had either facilitated or challenged the implementation process, see Figure 2. Lastly, conclusions were summarized in a logic model to guide future initiatives, see Figure 3. The consistency of findings was then



**Table 1:** Evaluation of implementation process through screening of identified documents. Factors which may have affected the quality of the implementation negatively are *italicized*.

QIF steps	Actions identified during review of documents
1. Conducting a needs and resources assessment	Reasons behind the initiative and addressed problems were explicitly described and motivated in the funding application. <sup>a</sup> Benefits of the improvements were thoroughly outlined regarding patients, <sup>a</sup> all though <i>sparsely concerning staff and organization</i> .
2. Conducting a fit assessment	The aim of the initiative matched the organization's goals and strategy for growth (expand number of treated patients), partly matched <i>mission</i> although not quite <i>priorities</i> . <sup>b</sup> It matched some but not all <i>consumer's cultural preferences</i> . <sup>c</sup> Taken together it matches the organization's vision rather than <i>needs</i> . <i>Adoptions</i> were needed.
3. Conducting a capacity/readiness assessment	The organization was early in its preparedness. Some means for implementation (skills, staff) were more assessable than others (motivation, will, technical staff). <sup>a</sup>
4. Possibility for adaption	Means for deployment of the intervention were <i>partly tested</i> and <i>modified to fit the patient group</i> . The intervention was substantially adopted to fit the host setting. <sup>e</sup> <i>Feedback</i> from the host setting was included although <i>not collected</i> in a structured way. <i>Changes</i> occurring during the implementation process were not <i>documented</i> or <i>monitored</i> in a structured way although sometimes mentioned in team meeting protocols. <sup>d</sup>
5. Obtaining explicit buy-in from critical stakeholders and fostering a supportive community/organizational climate	Explicit buy-in from leadership <sup>a</sup> with decision-making power and some front-line staff existed. <sup>f</sup> The consequences of possible <i>barriers</i> noticed in phase 1 were <i>not sufficiently accounted for</i> . Some <i>unresolved concerns</i> from front-line staff may have affected fidelity. Additional staff <i>champions</i> could have fostered and maintained buy-in. Implicit benefits created a supportive climate. <i>Incentives and disincentives</i> were not clearly outlined.
6. Building general/organizational capacity	Host setting routines for meetings eased communication. Clinical structures complicated decision-making <i>infrastructure</i> . <i>Knowledge</i>

**Table 1:** (continued)

QIF steps	Actions identified during review of documents
7. Staff recruitment/maintenance	<i>needed for interdisciplinary discussions of technical problems</i> were lacking. Short deadlines called for additional staff and less time for testing. Support was present in terms of the intervention and the deployment. Expertise in <i>implementation science</i> and <i>process evaluation</i> was not prioritized. <i>Decision-making power</i> was mostly aligned with roles and responsibility.
8. Effective pre-innovation staff training	Staff was trained in intervention deployment. <i>Some competence and staff skills</i> were not outlined <i>beforehand</i> . Front-line staff was <i>monitored and supervised</i> . <i>Feedback</i> was not collected in a structured way.
9. Creating implementation teams	Organizational responsibility was divided, mostly <i>explicitly</i> . The support team met <i>irregularly</i> . Team members had dedicated roles. <i>Processes and responsibilities</i> were mostly explicit, although not written down. <sup>g</sup> A controller was not appointed.
10. Developing an implementation plan	Time plan existed, with defined tasks, and sometimes accountability. <i>Foreseen challenges</i> were sometimes mentioned and sometimes documented, although not in the time plan and sometimes <i>not proactively addressed</i> .
11. Technical assistance/coaching/supervision	Technical assistance was present. Supervision was present. <i>Coaching</i> on a practical level to help deal with challenges or resolve conflicts was hampered due to competing assignments. Additional resources were added. Training and coaching was done ad hoc.
12. Process evaluation	<i>No plan</i> to evaluate implementation. Data on adoption and fidelity was collected unintentionally through the application. Data on cost-effectiveness was collected. <i>Data extraction</i> was complicated.
13. Supportive feedback mechanism	<i>No plan</i> for feedback. Process data was not explicitly collected, although <i>ad hoc</i> presented to interested stakeholders. <i>No vision</i> for how feedback should be used.
14. Learning from experience	Published scientific manuscript of RCT. <sup>h</sup> Knowledge is transferred to similar projects. <sup>i</sup> Project presentation. <sup>j</sup> Project report. <sup>k</sup>

Table 1: (continued)

QIF steps	Actions identified during review of documents
	Experiences are reflected upon <sup>1</sup> and collaborative relationships exist. <sup>1</sup> Subsequent similar projects are planned with host staff included in teams. Content and means of deployment build on ideas from and needs of host staff. Factors affecting implementation process will be thoroughly reviewed.

<sup>a</sup>Funding application Rehsam. <sup>b</sup>Annual reports Pain and Rehabilitation Centre. <sup>c</sup>[38]. <sup>d</sup>Notes from team meetings. <sup>e</sup>Outline of MMRP-interventions, appendix to [15]. <sup>f</sup>Documents from unit meetings. <sup>g</sup>Notes from start-up meeting. <sup>h</sup>[15]. <sup>i</sup>Funding application planned project. <sup>j</sup>Conference presentation Rehsam-meeting. <sup>k</sup>Written report to stakeholder Rehsam. <sup>l</sup>Evaluation of patients' experiences after pilot-testing in similar project.

checked by the research team. An inquiry audit was made by a researcher with comprehensive expertise in pain rehabilitation although not explicitly involved in the analysis process, to evaluate the consistency of findings.

## Results

The aim of this retrospective appraisal using the QIF was to describe actions relating to appropriateness, adoption and

sustainability, that could have affected the implementation of IACT as an add on treatment to IPRP. The analysis showed that many of the QIF crucial steps were carried out. However, some of them were not described, neither explicitly nor implicitly. The analysis resulted in two categories: facilitators and barriers (Figure 2). Conclusions drawn from the results are presented in a logic model (Figure 3).

## Phase 1: initial considerations regarding the host setting

Phase 1 actions were described primarily in funding applications and ethical approval protocols. Although several important facilitators were found, as leadership buy-in, this phase contains the most challenges. Noteworthy is that assumptions on influential factors, appears to build on experiences from previous implementation projects of the same intervention although for different patient groups or in other settings. Applying learned experiences onto the present host setting was probably accurate to a certain degree. However, patient-specific obstacles might have needed more attention, and this may partly explain why some implementation actions were not prioritized. First, the actions taken in steps 1 and 2 imply that the intervention was assumed to match the organization's vision and there through also fit problems that were expected to happen within a near future (i.e., increased number of referred

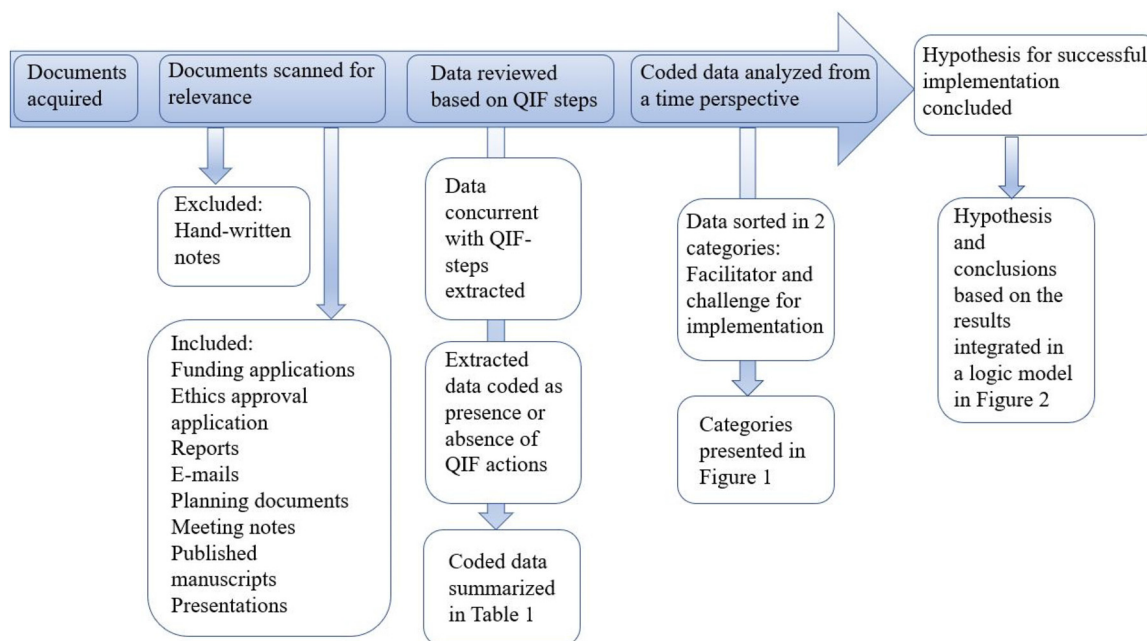
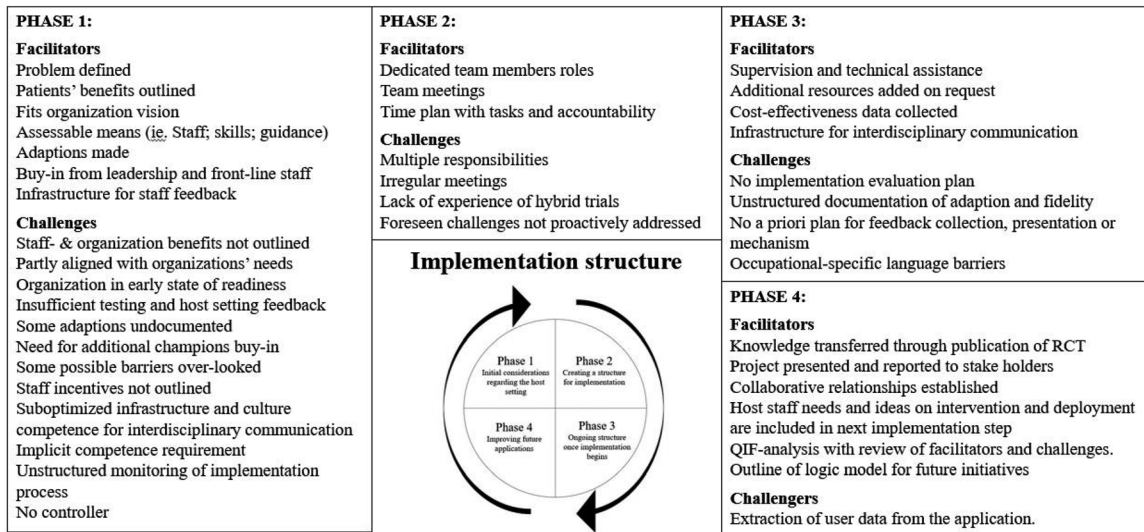
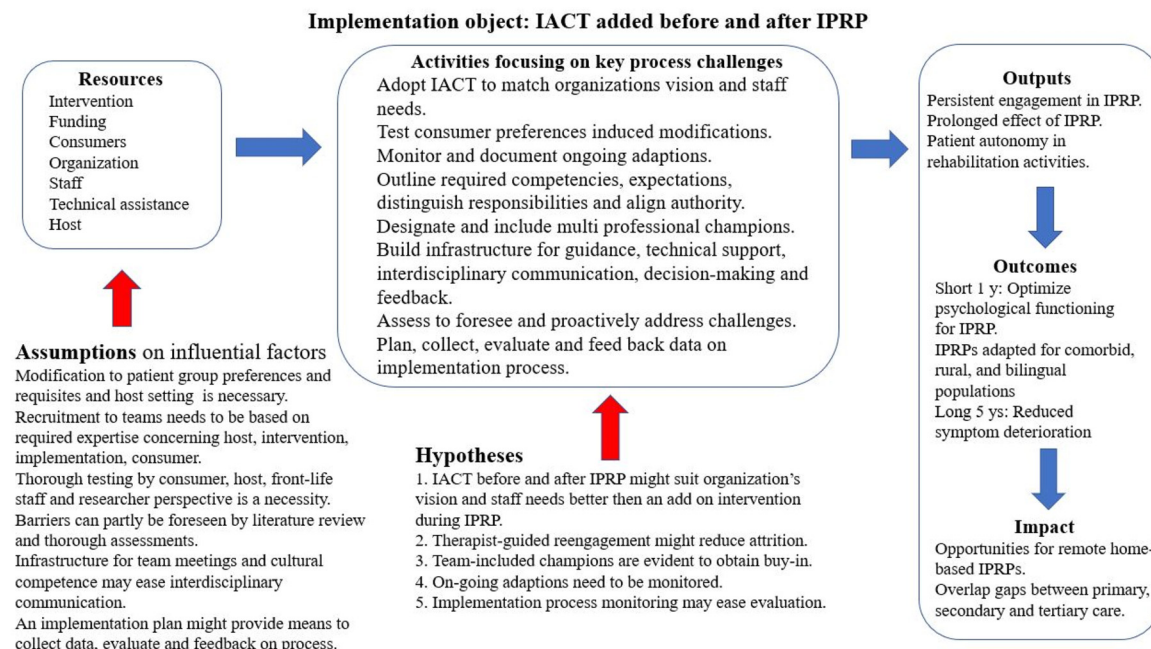


Figure 1: Flow chart of analysis.



**Figure 2:** Facilitators and challenges in the implementation initiative, summarized in each of the four phases of QIF respectively.



**Figure 3:** Logic model of implementation of IACT added before or after IPRP at a specialist pain clinic.

patients and stake-holder expectancies to transit to digital care). Secondly, benefits for staff, present organizational needs and consumer cultural preferences were not explicitly outlined at this stage. Due to short deadlines, the modifications made were tested by software engineers and staff, but not by end-users. Consequently, host setting feedback was not collected. Also, the absence of a plan for adoptions might be one reason to why changes occurring throughout the implementation process were not monitored or documented in a structured way.

The confidence in the intervention was high. Recruited staff had experience from previous successful implementation initiatives. Several of the competencies and roles listed in the QIF's crucial steps were indeed considered during team recruitment and capacity building. In some cases, the same person had several roles, as is common and often inevitable due to limited resources. However, required competences were sometimes implicit. Although supervision was frequent in the latter phases of implementation, the team worked more independently in the earliest stage.

Guidance from supervisors put the light on barriers that later would become apparent. However, some challenges were not foreseen, possibly due to hasty assessments in the initial phase and un-attentiveness to patient-specific barriers. Opportunities for staff feedback existed. A dedicated controller could have monitored this process. Additional host staff-recruited champions could have eased implementation as well as helped to discriminate between staff roles. Finally, infrastructure was not built to monitor the implementation process, wherefore some matters were dealt with as they occurred.

Summarizing the steps taken during phase 1, one point might be that the organization had faith in the intervention and respect for its efficacy due to previous positive research results. This might have hampered the implementation as some hurdles might have been over-looked. Overall, the organization appears to have been in an early phase regarding readiness to change, although interest, buy-in, dedication, skills, and guidance were satisfactory and favorable.

## Phase 2: creating a structure for implementation

In notes from start-up meeting, team meetings and unit meetings it appears as if team members invested time and effort into planning the intervention content and design. They also followed up on their responsibilities and were ambitious in performing tasks before deadlines and detecting problems as they occurred. However, missing actions in phase 2 refers to some of the over-looked actions in phase 1. Foreseen challenges were not addressed proactively. Implicit responsibilities and limited previous experience from hybrid trials sometimes hampered teamwork.

## Phase 3: ongoing structure once implementation begins

The cost evaluation plan shows that a considerable part of funding was aimed at technical support and additional funding was added to this post throughout the implementation process. Also, senior supervisors with expertise were connected to the team. Expertise in implementation theory and skills relating to collecting process data, evaluating implementation data and present such feedback, was however not added to the team until phase 4. Also, the need for scheduled support to deal with challenges and resolve conflicts did not become apparent to the team members in time. An infrastructure for communication was in place

(team meetings). However, problems still occurred due to culture barriers between technical staff and design staff. Besides difficulties to bridge occupational-specific languages, over-confidence in one's ability to understand the other party's needs and prerequisites might have had an effect.

## Phase 4: improving future applications

Extensive actions were taken in phase 4, such as sharing experiences with various stakeholders, in written reports and in oral presentations at conferences. Knowledge has been transferred to similar projects and some collaborative relationships exist. The many steps taken in this latter phase might be explained by the organization's vision to implement digital care and the perceived needs both by consumers and front-line staff. Also, the host setting is a clinical department at a university hospital with the responsibility and ambition to produce and disseminate research. As implementation research may still be regarded novel in this field, conceptualizing experiences may be essential to ease thorough assessments in phase 1 of future initiatives.

Key process challenges and steps that might need further attention considering condition-specific barriers and IPRP as host setting, are presented in Figure 3 (i.e., Logic model). These could be applied in the next step of dissemination, for example if IACT is given before or after IPRP, preferably in a type 2 hybrid effectiveness-implementation study, where the implementation strategy and clinical intervention are tested simultaneously [48].

# Discussion

## Principal findings

This retrospective report aimed to describe what actions affected the implementation process of IACT as an added psychological treatment alongside IPRP. The appropriateness of IACT for chronic pain is worthy of investigation as IACT has not yet been disseminated in chronic pain clinics as it has in psychiatric care. The complex feature of pain rehabilitation programs could add to explain some of the difficulties to align IACT to a clinical setting where multiple professionals, multiple modalities and multiple caretakers are involved. Alignment and other key process challenges found in the results from this study are presented in Figure 3 and will now be discussed.

Infrastructure for meetings and awareness of cultural competences are known as important to facilitate effective



communication among team members during implementation, in this case system developers and health care givers. The result in this study shows that frequent team meetings and detailed specifications eased collaboration within the project team. However, both technical staff and clinical staff, were overconfident about their ability to understand the others intention. Together with lack of time for testing as the application was developed, some technical functions caused disturbance even though they were perceived as unproblematic and also did not serve their purpose. Thorough testing, especially of data extraction, is therefore listed as an influential factor in the Logic model. Monitoring adaptations and collecting implementation data during the initiative are also noted as key process challenges.

The steps in the first QIF-phase details how to assess readiness. However, certain aspects of readiness, as incentives for caregivers, fitting with organizational needs, staff competence and end-users' motivation, might be more difficult to assess compared to an organization's vision or patients' benefits from a caregiver point of view. One potential hurdle in the present implementation process might have been that part of the context was not yet fully prepared for change. Perhaps, this might be more common in health care services where tradition, routines and experience are highly valued as it preserve stability and continuity. The theory of diffusion of innovation [58] might help to explain the diversity of readiness within an organization, where the research team members might be innovators and early adopters, while the greater part of caregivers and staff, approximately four out of five, are followers, late adopters or laggards.

Descriptive analyses, appraisals, comparative case studies and guidelines for integrating internet delivered psychological interventions in routine care are now emerging [19–22]. The present study uses a different approach to improve the planning and design of future IACT for chronic pain, namely an implementation science perspective focusing on contextual factors and caregivers as stakeholders. The present project stems from a line of earlier [12, 16, 38] and similar projects [35, 36] and builds on to a growing body of evidence. The unique contribution and novelty of the present study is that the result is presented in a logic model for future implementation projects. Logic models are a foundation in implementation work and there is to date no similar description in the literature to take guidance from when planning and designing implementation of IACT for chronic pain. The detailed descriptions of possible influential factors and potential key process challenges makes a logic model valuable and relevant for clinicians in the progress of designing and implementing IACT for chronic pain.

## Strengths and limitations

The QIF was chosen as framework for this retrospective evaluation of a hybrid 1 effectiveness-implementation study because of its suitability when evaluating the implementation of a novel intervention into an established setting; IPRP. Noteworthy is that IPRP is a complex intervention, intertwined with other on-going processes as pharmaceutical follow ups and the sickness benefits system. The QIF provides a comprehensive set of questions that focus on actions, which helps in both planning and evaluation of an implementation process. However, there are some methodological concerns in need of attention.

The present QIF-analysis was led by a project team member acquainted with the cultural preferences of chronic pain patients and with knowledge of the intervention and the setting, to ensure validity in innovation fit [49]. The categorization was done in collaboration with a researcher with comprehensive expertise in internet delivered interventions, which allowed for comparisons with ICBT and IACT implementation in other fields, besides recognizing blind spots. However, the contribution from a second co-rater, independent from the initiative, with expertise in implementation research could potentially have yielded different and complementing information and enhanced the study's credibility through analyst triangulation.

No quantification of the collected data was done, as the main purpose was to find implementations actions, evaluate their impact and create a logic model. However, quantifications are important for comparisons with similar initiatives, measuring success and evaluating changes made to improve dissemination. Although, when measuring adoption and appropriateness, qualitative data might contribute more.

In spite of these limitations, there are also some strengths. The QIF enables triangulation by gathering of data from several sources, in this case different kinds of documents, which speaks for the study's credibility. The specific questions in the 14 steps in the QIF analysis, guides data coding and enables other researchers to repeat the analysis. Also, the specificity of the questions helps the rater to stay consistent with the raw data, which speaks for the study's dependability, as do the detailed flowchart of analysis (Figure 1: Flowchart of analysis process) together with Table 1 and Figure 2, which allowed for an inquiry audit by a researcher with expertise in IPRPs. Concerning confirmability, an audit trail was not applied in this study, as the QIF already provides a rationale for coding. However, Figure 1 shows the rationale for decisions made during the process and constitutes a mean for reflexivity.

Another strength is that this study evaluated an implementation process in a regular clinical setting for patients with chronic pain and comorbidities. Also, the intervention was given by host staff. Stakeholders were involved and all the usual matters of clinical service were present, as sudden shortage of resources, prioritization changes and staff transfer. For example, infrastructure for communication had to be aligned with other clinical processes. Also, recruitment of clinical key champions, who promotes the initiative at host-level, may have been affected by organizational structure and culture. This makes this implementation study representative of some aspects of the real-world experience of caregivers in clinical practice, implementing IACT into IPRP.

However, the benefits of the clinical setting may compromise the transferability of the findings. To make the logic model as clinically useful as possible it contains thick descriptions of the initiative, specifying influential factors, resources and desired output, outcomes, and impact. Hence, the applicability is limited compared to a generic model transferable to chronic pain rehabilitation settings in general. However, the purpose was to specify key processes for implementation of IACT in IPRP, which is widespread and well-established in Sweden [59] and other Western countries.

## Recommendations for future research

There are examples of process evaluations of internet delivered interventions where a TMF has been applied when IACT was added to routine care [60]. However, more usual is that evaluations are done retrospectively using qualitative analysis [61]. When moving on to hybrid-2 studies where implementation is studied along-side effectiveness trials in clinical settings, there are benefits of applying a TMF from start. A TMF provides means to plan, monitor, collect data, evaluate the process, and adopt the initiative as the implementation occurs.

One observation concerning QIF though, is that it does not specifically invite the researcher to use lessons learned from previous initiatives. Considering the ongoing digitalization of rehabilitation for chronic pain, one way to ease implementation may be to focus on population-specific barriers, especially negative effects of treatment and risks for attrition [38, 62]. Such known hurdles may point to which implementation actions need extra attention. Also, a research project controller may continually ensure that assigned responsibilities with aligned authority are sufficient to foresee and detect hurdles and adopt the initiative in time.

Considering the many factors that may influence implementation; host setting, caregivers, end-users, stakeholders, intervention and format, logic models may be helpful to target key process challenges, meanwhile considering resources, assumptions and relevant outputs, outcomes and impacts for the specific intervention, format, diagnosis and context. Potentially, sustainability in implementation depends on an ongoing change process that ensures the continuity of facilitating implementation actions that maintain factors crucial to success, although flexible to the changing needs among organization, provider and end-user. The logic model presented here (Figure 3) attempts to address some of those key process challenges.

## Relevance to clinical practice

To move implementation science forward, attention to implementation outcomes enlighten us on the effect of implementation actions. In the present study we focused on adoption of IACT for chronic pain, its appropriateness and actions relating to sustainability. We suggest that sensitivity to the changing needs in a clinical setting is evident for sustainability of IACT for chronic pain, along with the use of a TMF in the purpose to plan and evaluate not only the intervention but also the implementation process. The result show that sustainability may be challenged by unfitting capacity building in QIF phase 1 and insufficient attention to structure in phase 2. Appropriateness to the organization was facilitated if infrastructure for communication (in phase 3) resembled the already existing structure in the organization and challenged by an insufficient needs assessment in phase 1. Adoption was facilitated by involving staff key champion in all QIF phases and the ability to adapt to occurring hurdles during phase 3.

The primary implementation outcome in this study was appropriateness for organization. When summarizing the results, two ideas to better the appropriateness of IACT for chronic pain emerge, concerning aim and timing of IACT for chronic pain. First, psychological interventions in IPRPs are primarily group based, with potential to affect pain-induced anxiety and depression [63], although psychiatric conditions are not specifically targeted. ICBT has been found helpful in treating comorbidities alongside face-to-face treatment [64]. If thoroughly aligned, the transdiagnostic approach of IACT may also be helpful as an add-on individual psychological treatment focusing on psychiatric comorbidity alongside IPRP.

Second, the next step of implementation in clinical pain services may be to add IACT before or after IPRP. As a pre-treatment, IACT could potentially prepare patients for face-

to-face sessions, help with setting goals, teach key concepts and basic ACT skills, give psychoeducation and explore expectancies for IPRP [22]. A second alternative may be to add IACT after IPRP, to encourage continuous self-care by applying learned skills [16] and by sharing treatment content with significant others to create a supporting environment [45].

## Conclusions

The present study adds to a growing body of knowledge as it suggests key process challenges, hypotheses, and potential influential factors in a Logic model (Figure 3), from an implementation science perspective. The first conclusion from the present appraisal is that a TMF may be beneficial to align IACT and IPRP for a successful implementation. A second conclusion is that there might be condition-specific key implementation actions, that either facilitate or challenge implementation. Lastly, previous successful implementations from related fields suggest that IACT may work as a complementary tool to treat comorbidities individually, wherefore we suggest that a sequential approach where IACT is given before or after IPRP may be a possible next step.

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