Optimising the development of sustainable internet-based occupational therapy interventions: Important key actions and perspectives to consider

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ABSTRACT

Background: By examining the health needs of the general population and utilising the potential of digitalisation as a driving force, new internet-based services need to be developed in occupational therapy. However, existing guidelines for the development of complex interventions provide scant information on how to develop internet-based interventions.

Aim: The aim of this paper is to share experiences and illustrate important key actions and new perspectives to consider during the innovation process of developing and designing an internet-based occupational therapy intervention.

Method and Materials: International guidelines for intervention development was reviewed to add important perspectives in the innovation process.

Results: The illustration focuses on five key actions in the development phase to highlight new perspectives and questions important to consider when designing new internet-based occupational therapy interventions.

Conclusion: The new perspectives can complement existing guidelines to enhance the development of more effective and sustainable internet-based interventions.

Significance: The illustration provided has potential to improve the sustainability in innovation processes of new internet-based occupational therapy interventions.

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Introduction

The digital transformation and societal challenges related to peoples’ health place high demands on innovation of new services in occupational therapy (OT) [1–3]. Together with individuals having to take a greater responsibility for their health, there is a need for rehabilitation and prevention opportunities to adapt to these challenges, including how such interventions are delivered [4–6]. Interventions also need to be more accessible and distributed in a way that promotes equal health for all citizens [4–6]. In this, e-health services delivered through the Internet and associated technologies are a way forward. This is also in line with the core values of welfare innovations [7,8] emphasising increased productivity (e.g. providing more OT services to the same or at a reduced cost), improved service (e.g. more individually tailored OT service), and improved outcomes (e.g. sustainable health, maintaining an active life while living with a life-long chronic condition). However, newly developed innovations in OT services that take advantage of digitalisation possibilities, including products or services such as internet-based interventions, are scarce [9–11].

New OT interventions (e.g. [12,13]) are increasingly being developed based on the MRC guidelines [14,15] that describe how complex interventions are best developed and evaluated. Complex interventions often have a number of interacting components that influence the process and outcome, which require new behaviours from both the receivers and those who deliver the intervention [14,15]. The innovation process can become even more complex if an already existing intervention in a traditional format is adapted to digital modes for delivery. That is, they have to match users’ (clients and professionals) needs and conditions, especially if clients and professionals in the health care organisation have different digital...
competences. Furthermore, an innovation process often includes the development of a new intervention that includes the use of a new digital solution. Taken together, we argue that those who design internet-based interventions need to have knowledge of the digital competence [16] among different groups of users, be aware of the principles and theories suitable for distance learning, employ a user-centred design [17], and engage in cocreation or coproduction [18–20] of digital solutions. To our knowledge, existing guidelines does not clearly outline and merge together the variety of knowledge needed to scientifically develop and evaluate complex internet-based interventions in OT. Therefore, we set out to illuminate how a sustainable innovation process can evolve based on our experiences while creating the internet-based OT intervention ‘Strategies for Empowering Activities in Everyday life (SEE) version 1.0’ [21].

The ambition is to share experiences and provide an opportunity to learn more about key actions and perspectives that are important to consider for sustainability when a new, digitalised intervention is developed.

The aim of this paper is to share experiences and illustrate important key actions and new perspectives to consider during the innovation process of developing and designing an internet-based OT intervention.

### Key actions in an innovation process of an internet-based OT intervention

In this paper, we will outline and illustrate five key actions (Table 1) that we consider to be important in the early stages of the development and design of a new internet-based OT intervention, SEE [21]. During the innovation process, we were inspired by the steps outlined in the MRC model [14,15] as well as other recent international guidelines for intervention development [19,22]. Consequently, the five chosen key actions derive from existing guidelines (that is referred to in the description each key action). We will, also using SEE as a showcase, highlight new perspectives important to consider during the process by providing questions (Table 1) that can be used during the key actions to guide future innovation processes of internet-based interventions.

### Operationalising the idea of a sustainable internet-based OT intervention

The first key action is to operationalise the idea of a sustainable internet-based OT intervention. In other commonly used guidelines, this key action is often limited to problem identification or understanding [19,22]. When operationalising the idea of SEE [21], we (the researchers) considered the driving forces for innovations such as citizens’ needs and growing expectations, new technology and sustainability, as well as the core values of welfare innovation, including striving to improve productivity, services and outcomes [7,8,18] when examining current evidence.

One of the driving forces for SEE [21] was the need for new interventions, a need based on the rights of people with disabilities to engage in activities and live an active life in society on equal terms [23]. This is a societal challenge since a large number of people worldwide live with a neurological disorder and experience activity limitations that can compromise their possibility of living an active life [24,25]. Neurological rehabilitation in the early phases of, for instance, a stroke, is well developed but focuses on restoring function rather than on needs related to living an active everyday life or facilitating the process of change people go through to adapt to a changed capacity and life condition [26–29]. Moreover, access to neurological rehabilitation and prevention is limited and not equally distributed in Sweden [30,31]. Consequently, there is a need for new rehabilitation and prevention interventions that support people when they try to adopt sustainable strategies to regain and maintain an active everyday life. Internet-based services and interventions have been described as suitable alternatives with the potential to improve access to rehabilitation and enhance the provision of individually tailored interventions [9,32–35].

An early decision when operationalising the idea of SEE [21] was to target the change process for an active life rather than taking a starting point based on specific diseases or injuries. Another important aspect was to utilise a person-centred approach where the design of the intervention had to allow for flexibility in adding content associated with specific needs related to an active life. Despite being an individual intervention, its delivery format also had to be flexible enough to be changed to a group format or a team-based intervention later on. Consequently, the intervention was designed to match many clients’ needs, although scientific testing and evaluation were planned for specific diagnostic groups. Designing a general intervention that matches the health needs of many clients may save development resources as well as OT resources when they do not need to access different treatment programmes on different platforms for various health conditions.
Another important early decision was to consider how the content and the outcome would provide tools for sustainable changes in health. Hence, the goal of SEE [21] is to support a balanced pattern of various daily activities, at different places, and together with other people to promote an active life and health. Thus, the content was designed to empower clients to ‘see’ their activities in a new light and develop management strategies in activities. The goal was also to empower clients to take on an active role to prevent and overcome problems and challenges in everyday life that were sustainable over time.

Finally, to ensure the sustainability of the intervention, we examined the context and the prerequisites for internet-based interventions in the specific settings where it was planned to be used. The preliminary draft intervention was discussed with professionals (occupational therapists, managers at different levels in the organisation and health platform administrators). They confirmed and agreed on the relevance of the intervention and mutually agreed to deliver SEE through the ‘support and treatment platform’ within the Swedish 1177 health care guide [36], a secure platform that is accessible in all regions in Sweden and used to a varied extent by both citizens and professionals. Utilising an already existing platform has the potential to facilitate delivery and provide for an equal distribution of the intervention across the country in the future, as well as to avoid problems and save resources.

In summary, starting with clients’ needs, the early decisions described above reflect how the driving forces and the core values of welfare innovations [7,8,18] were considered in different ways during operationalisation. Based on these experiences, we suggest perspectives important to consider during the first key action ‘Operationalizing the idea’ in Table 1.

Table 1. Overview of key actions, new perspectives and questions suggested to inform the innovation process of internet-based interventions in occupational therapy.

| Key action                                                                 | Perspectives and questions to consider in the key action                                                                                                                                                                                                 |
|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Operationalising the idea of a sustainable internet-based OT intervention | - What are the driving forces that guide the innovation process of the new intervention?  
- Which sources or methods will ensure that the users’ needs and conditions are addressed by the intervention, and how can users be involved in the creation of the idea?  
- How can different core values of welfare innovations guide the operationalisation of the intervention idea, its content, delivery and outcome? |
| 2. Designing the innovation process of developing an internet-based intervention | - How can different approaches, frameworks and/or models guide the development phase for a sustainable innovation process?  
- How can different approaches, frameworks and/or models guide the design of an internet-based intervention in an evidence-based frame?  
- How can innovation models and models focusing on the design of internet interventions inform key actions important for the innovation process?  
- How can users be involved in the design of the innovation process? |
| 3. Identifying and developing evidence underpinning an internet-based intervention | Knowledge to inform the content of the intervention.  
- Is there enough evidence to underpin the modelling of the content of the intervention?  
- What is known about clients’ engagement in activities in everyday life in relation to improving services and outcomes?  
- Is there a need to develop new knowledge about client groups’ activities in everyday life and their self-initiated strategies to overcome or prevent problems (by, e.g., performing empirical research or systematic literature reviews)?  
Knowledge to inform the web-design and delivery.  
- Which characteristics in the design of internet-based interventions facilitate clients’ engagement, self-regulated learning and adherence during the intervention process as well as outcomes?  
- How can the interaction and communication between the client and the professional be designed to facilitate the client change process?  
- Which potential barriers and facilitators are known regarding internet-based interventions, and how can this knowledge support the design?  
- What is known about the users’ (clients and professionals) access to, and ability to use internet-based services? |
| 4. Articulating programme theory                                             | - Which theories and knowledge are needed to inform the content of the intervention to promote the outcome?  
- What knowledge is needed about the mechanism of change to inform the design and delivery of the intervention to enhance clients’ self-regulated active learning on distance?  
- What knowledge is needed about the mechanism of change to enhance professionals in supporting the client?  
- How can different core values of welfare innovations guide the development of programme theory? |
| 5. Modelling the prototype                                                   | - How can previous key actions be integrated into a prototype that meets the core values of welfare innovations (improved service and outcome as well as increased productivity)?  
- How can the prototype be designed with users? Which users are important to include in the different phases of modelling the prototype?  
- How can the intervention be evaluated scientifically, and what research designs are suitable? |
Designing the innovation process of developing an internet-based intervention

The second key action is to decide which approach, framework or model, or combination of these [19], can guide the innovation process when developing and designing the internet-based intervention. When developing SEE [21], we considered a variety of innovation models as well as frameworks or approaches for intervention development. Innovation models focusing on designing new products or services can emanate from fields outside health care, often with a focus on business development [7,37] but can be adapted to the context of health care [7,38]. The innovation processes in these models are not necessarily based on reviews of current scientific evidence but rather on experienced needs and relevance in the present context. However, health care interventions need to be based on evidence and developed and evaluated in an evidence-based way to provide evidence-based practice and sustainability [15]. Models for intervention development [19,20,22] can be seen as another kind of innovation model that focuses on a new service in terms of a whole intervention [14,15]. These models are scientifically based but do not necessarily provide the detailed guide and tools necessary to develop a digital solution, e.g. the web layout together with the users. There are also models focusing specifically on designing internet interventions [39–42]. Even if these models are implemented within a scientific framework, they do not necessarily involve the scientific base needed to develop and evaluate a new intervention. Thus, it is important to make an informed decision on how to be guided by different models during the development phase of an internet-based intervention.

In developing SEE, we found it favourable to combine the MRC guidelines for complex interventions [14,15] with other, more comprehensive guidelines that describe the development phase of interventions [19,22]. These guidelines [14,15,19,22] inspired an iterative innovation process for developing and designing interventions on scientific grounds involving several actions. The guidelines [19,22] support a sustainable innovation process based on research and theories, including close collaborations with receivers and deliverers. As these guidelines included different and complementary key actions for the development phase, we considered it as a strength to use both to ensure that important actions were not overlooked. Thus, the feasibility of the intervention as well as the sustainability of the long-term health outcome was optimised. In applying these guidelines [19], researchers are encouraged to be open to whatever actions are relevant rather than following cycles with predetermined actions. Additionally, the guidelines explain how to scientifically scale up an intervention [14,15] that ultimately enables an evidence-based intervention programme and implementation. Individual dialogues and discussion groups with managers and occupational therapists at the clinic revealed that an important vision for the clinic was to digitalise and improve rehabilitation in a way that ensured evidence-based practice. Thus, the relevance of selecting guidelines that enabled this was necessary. Moreover, we found components and tools in the other models for innovation and internet design as valuable resources in other key actions of the innovation process. Based on these experiences, we suggest important perspectives to be considered during the key action ‘designing the innovation process’ in Table 1.

Identifying and developing evidence underpinning an internet-based intervention

The third key action is to review and synthesise evidence and, if needed, conduct scientific research to complement the evidence base that supports the design and delivery of the intervention [14,19,22]. When we identified the evidence to develop SEE [21], we considered the core values of innovations, i.e. increased productivity, improved services and outcomes [7,8]. During this process, we reviewed research on clients’ needs and whether existing interventions match these needs (i.e. evidence foremost related to the innovation core value of improved services and outcome). Research on change processes was reviewed to identify therapeutic components important to achieve a change (i.e. evidence foremost related to the innovation core value of improved outcome). Additionally, we reviewed models of internet-based interventions and the evidence of the effectiveness of internet-based interventions in relation to users’ experiences and abilities (i.e. evidence foremost related to the innovation core values of increased productivity and improved service). Consequently, to design this new intervention we needed to review various evidence. This review identified knowledge gaps of peoples’ activities in everyday life that needed to be filled in to inform the content of the OT intervention. Also, knowledge available to inform the web-design and the delivery of the internet-based intervention. These reviews are described more in detail below.
The review of research evidence, based on the aim of the SEE [21], showed a knowledge gap regarding peoples’ experiences of engagement in activities in places outside home, occupational balance, occupational values and self-initiated management strategies in activities. This knowledge was considered as important to improve the service and the outcome (core values of innovation) of the new intervention. Therefore, empirical research on clients’ experiences and a meta-synthesis were conducted to provide a more complete evidence base underpinning SEE. From the synthesis of the present and new evidence (e.g. [25–28,43–52]), it became evident that SEE needs to build on a more complex understanding of activities in everyday life than are commonly applied in current rehabilitation c.f., [44,45,52]. Usually, activities are considered in isolation from each other or from an independence perspective. Our synthesis showed that it was important that the content of the intervention acknowledged the whole pattern of activities to find a sustainable level of engagement in activities in relation to a changed capacity and life situation. The evidence also showed the importance of and the challenge of taking on an active role in developing self-initiated strategies to manage changes in activities in everyday life or to prevent problems from arising, e.g. [44,45,53–56]. In the meta-synthesis [56], a large number of self-initiated management strategies were identified that could be included as therapeutic components in the intervention. Our experiences show the importance of identifying unknown or overlooked perspectives important to the content of the intervention and how they can provide an improved service and outcome. Based on the experiences of SEE, we suggest that during the key action ‘Identifying and developing evidence’, it is important to consider the perspectives in Table 1.

Identifying and developing evidence

Articulating programme theory

The fourth key action is to form programme theory that articulates and includes all knowledge needed, i.e. the crucial therapeutic components that make the intervention work as intended [14,19,22,64]. Based on the intention to develop an intervention delivered by the internet [21], we found it necessary to consider knowledge that would enable effective delivery in this format. This knowledge was needed to provide for the modelling of the therapeutic components, i.e. the mechanism of change that makes the internet-based intervention work. In this process, we also found it important to again consider the three core values of welfare innovations, i.e. striving to improve productivity, services and outcomes [7,8], to ensure a sustainable intervention.

An overview of examples of questions asked to identify the various components in the program theory of SEE and their role in making the intervention work as intended is presented in Table 2. Based on the empirical research forming SEE (third key action), a review identified occupational therapy theories of the complexity of engagement in activities in everyday life [65–68]. Together with theoretical perspectives and principles of person-centeredness [69–72], the foundation of the intervention was formed, including each unique client’s situation and needs, with participation, sharing and transparency as important elements. The process of self-management [29,33,73–79] added knowledge of the importance of the clients’ active role when adopting strategies and implementing these strategies into their everyday life. Perspectives on motivation [80–82] were also identified and they play an important role during the intervention process as well as for improving the outcome where professionals can use the tool of motivation interviewing. Rehabilitation methodology [83] is also a component of the programme, as it contains principles for how to actively involve the client when the plan for their change process is established. As the programme is internet-based, pedagogical principles, i.e. flipped classroom [84–86] techniques suitable for distance learning and having the potential to support self-regulated learning, were integrated into the
Table 2. The questions and components forming the program theory of SEE version 1.0.

| Knowledge needed to develop the program theory of an internet-based OT intervention, examples of questions related to content and mechanism of change | Components in the program theory of SEE | How knowledge from the component contribute to SEE, examples |
|---|---|---|
| What are clients’ needs in relation to activities of everyday life? | Perspectives of clients: Evidence from empirical research and reviews of changes and needs in activities of everyday life. | Inform the need, focus and content of the intervention. Guide occupational therapists person-centered and occupation-based reasoning in the intervention process. |
| How can the complexity of engagement in activities in everyday life, changes herein and strategies to facilitate health be understood and supported throughout the change process? | Perspectives on humans’ occupations in everyday life and how occupation can be both a mean and an end in the therapeutic processes: Models in Occupational therapy | Inform the content of the intervention of how to support activity of everyday life. Guide occupational therapists to be person-centered and utilise occupation-based reasoning during the intervention process. |
| How can person-centeredness be supported throughout the change process? | Person-centered health care/occupational therapy: Evidence and perspectives of person-centeredness | Inform the design of the intervention of how to enhance person-centeredness. Guide occupational therapists to tailor their reasoning and acting to each clients’ unique situation and needs during the intervention process. |
| How can clients’ motivation be identified and supported throughout the change process? | Perspectives of motivation: Motivation for change and motivational interviewing | Inform the design of the intervention of how to support clients’ motivation in the change process. Guide the occupational therapists reasoning about motivation and dialogue to facilitate clients’ motivation in the intervention process. |
| How can clients be supported to take on an active role and adopt self-management strategies? | Perspectives of managing chronic health conditions: Evidence and perspectives of self-management | Inform the design of the intervention of how to facilitate clients to take on an active role and act proactively by self-management. Guide occupational therapists reasoning of how to support self-management in the intervention process. |
| How can a plan for change be established through active collaboration? | Perspectives of rehabilitation: Rehabilitation methodology | Inform the design of the intervention of how clients can be supported in taking an active role in formulating the plan for their change process. Guide occupational therapists reasoning of how to support clients’ active role when establishing the plan for the change process in collaboration. |
| How can clients’ self-regulated learning on distance be supported? | Pedagogical perspectives: Evidence and perspectives of Flipped-classroom | Inform the design of the intervention’s combination of video-clips providing new knowledge, with clients’ reflections and digital assignments. Guide the occupational therapists reasoning of how to support clients’ reflection and self-analysis based on the new knowledge. |
| How can internet-based interventions be designed optimally to support users and facilitate the intended outcome of the intervention? | Perspectives on internet-based interventions: Evidence and perspectives of web-design, delivery and usability. | Inform the design of the web-format and the interaction between clients and occupational therapists to support feasibility, acceptability and efficiency. |

programme. That is, new knowledge is mediated through short videos prior to meetings with the OT. This leaves more time for processing the content of the films and supporting the client in taking on an active role in the change process instead of spending time on providing basic information. This suggests that the service provided, as in SEE, can be improved and has potential for improving cost-effectiveness. Based on the experiences of SEE, we suggest important perspectives to be considered during the key action ‘articulating programme theory’ in Table 1.

**Modelling the prototype**

Based on a knowledge synthesis of the above key actions, the fifth key action concerned modelling the prototype, including the intervention process as well as its outcome measures [19,22]. This key action aimed to ensure and increase its applicability in practice. When modelling the prototype of SEE [21], we found that it is important to design an intervention that realises the core values of welfare innovations [7,8] to ensure improved outcomes, services and productivity.

The modelling of SEE was conducted in several phases together with users, and resulted in three parts: i) the internet-based intervention, ii) an intervention guide, and iii) a professional internet-based educational programme [21]. Figure 1 gives an overview of the intervention. The researchers designed an early prototype version of the internet-based intervention that included modelling the intervention, the intervention process and the outcomes [19,22]. Early on, it was decided that the internet-based intervention would comprise an initial pedagogical part that would be followed by an activity plan with individually
Evaluation and reflecting on activities in everyday life

- Initiate a self-reflection process of engagement in activities in everyday life and of management strategies in activities
- Assessment tools including interview and self-report questionnaires to evaluate a complexity of activities in everyday life and changes herein to support the process
- Online video-meetings with the occupational therapist (OT) that support the reflection process
- Week 1

Modules supporting learning and self-reflection for an active life

- Module themes provided by the health care platform on Internet:
  - Introduction
  - 1. Changes in activities after stroke
  - 2. Value and meaning of activities
  - 3. Activity pattern
  - 4. The complexity of activities
  - 5. Activity balance
  - 6. Strategies to support activities
  - 7. Prioritize and make changes in activities
- Modules aim to support the client to "see" their activities in a new light to support change
- Modules includes educational video-clips, reflections and digital assignments that is further processed by feedback of and online video-meetings with the OT in accordance with the intervention guide
- Week 2-4

Establishing the activity plan for an active everyday life

- The plan with person-centered goals and strategies guide the change process
- The long-term goal focuses on achieving a healthy and balanced pattern of activities to support an active everyday life
- The short-term goals include prioritized changes in activities, management strategies for activities and a time plan for evaluation
- Online video-meeting with the OT when the pain is established in accordance with the intervention guide
- Week 4

Implementing the activity plan

- Client work with the change process through realising/implementing the activity plan to reach the goals
- Regular individually tailored online follow-up and supportive video-meetings with the OT in accordance with the intervention guide
- The intervention process ends when goals in the plan are reached
- Week 4

Figure 1. A schematic illustration of SEE version 1.0.

tailored sessions. The pedagogical part of the intervention was designed as a number of flexible modules that are easy to change in the future. It was decided that only one module would include changes and needs in activities in everyday life related to the diagnostic group in focus (e.g., stroke, module 1) and that the other modules would be general to provide for flexibility. Each module focussed on different aspects of how a balanced pattern of various activities in everyday life can be obtained and it was designed in a flipped classroom manner. That is, each module was delivered the same way starting out with short videos and related client assignments, followed by regular feedback and online sessions with the occupational therapist. During this design process, preliminary prioritisation was made by the researchers regarding the content, modes of delivery, dose, intensity, and time duration to find an optimal balance between efforts, costs and outcomes [15]. Furthermore, an activity plan for active everyday life was designed to guide the forthcoming change process when the modules were completed. The activity plan includes long- and short-term goals, strategies/actions, time frames and evaluation. In this innovation process, we also chose assessment tools that have the potential to i) identify and recruit suitable clients to the programme; ii) support clients in starting a process of change; and iii) evaluate the outcomes of participating in the programme. The process of modelling the internet-based intervention continued with several discussion groups [87], with reference panels of occupational therapists and managers working at different clinics where the intervention was planned to be applied. When the content was finalised, the modelling of the intervention was conducted within the frames of the platform in the Swedish 1177 health care guide [36], together with an administrator experienced in distance rehabilitation. During this process, it became evident that the occupational therapist needed an intervention guide and education about the programme theory to ensure that the intervention was implemented as intended. The educational programme for the occupational therapist also included knowledge of how to support a client in their process of change and how the national health care platform was used together with clients. The modelling of these parts (the intervention guide and education programme) was conducted through consultation, critical reading and workshops with the occupational therapists and with lecturers experienced in distance learning for occupational therapists. Currently, the SEE prototype (SEE version 1.0) (Figure 1) is being evaluated scientifically in a case study [88] and feasibility studies [15], involving clients, occupational therapists and managers at different organisation levels, with the aim of refining and finalising the modelling of the intervention. Based
on the experiences of SEE, we suggest important perspectives to consider during the key action ‘modelling the prototype’ in Table 1.

Concluding remarks

This paper provides perspectives and questions important to add to the innovation process when internet-based interventions are designed and developed. These new perspectives can complement current intervention guidelines in the early stages of development. Consequently, the new perspectives should be used together with existing guidelines [14,15,19,22] that provide more knowledge about key actions, scientific methods and co-creation during development. Our ambition is to share experiences and provide an opportunity to learn more about key actions and new perspectives that are important to consider during the innovation process. Potentially, our experiences can contribute to the more effective and sustainable development of internet-based interventions. Nevertheless, our discussions are limited to our own experiences and the fact that the key actions undertaken are influenced by team competence as well as the context of the SEE intervention. Moreover, there is a need for flexibility when methods for collaboration are applied as the innovation process evolves. Readers are encouraged to consider the relevance of each key action, new perspective, question and methods in relation to their specific intervention idea and context as well as the team constitution.

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