

eHealth challenges in rehabilitation processes - rehabilitation professionals' experiences in the North Savo region

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Abstract

Aging people are forced to steadily extend their working-lives since the old-age dependency ratio will rise considerably in the near future. Meanwhile, social and healthcare resources will become increasingly scarce, although the need for healthcare and rehabilitation services is bound to increase. The aim of this study was to examine rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process in the North Savo region. The research was carried out as a part of the European Social Fund (ESF) funded project "Expertise and Business Network for Rehabilitation Services in Northern Savo".

30 rehabilitation workers were interviewed (67% women) in 2020. The participants were aged 24-60 years and their job titles were e.g. doctors, physiotherapists, practical nurses and community sector representatives. The interviews were carried out using a semi-structured format. The interviews were recorded, transcribed, and analysed using the inductive content analysis method.

The technology and digitalisation experiences of the rehabilitation workers in North Savo region can be divided into five categories. Technical problems causing challenges in rehabilitation included inadequate information and patient data management, and poor or lacking data-applications, ICT-tools and systems. The cost of technology was perceived as a factor influencing rehabilitation from both an individual and organisational perspective. The emergence of COVID-19 has had a positive impact on the use of technology and digital services. Suitable technology and digital services for rehabilitation need to be developed towards a more individual, client-centric direction. To promote the adoption of technology in the field of rehabilitation and to support positive change in attitudes towards technology, more education is needed.

The ever-evolving field of rehabilitation demands effective eHealth applications and processes alongside highly competent rehabilitation professionals to meet the needs of the aging population base in North

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Savo region. There is a need for more client-centric eHealth and rehabilitation processes, wherein the rehabilitation workers' needs are met – physically and psychosocially. By bringing together rehabilitation and ICT expertise in North Savo region, it is possible to provide training and education to raise the level of both the rehabilitation processes and level of expertise of rehabilitation workers in the region.

Keywords: rehabilitation, eHealth, technology, education, COVID-19, development

Introduction

The world population is aging and the prevalence of noncommunicable diseases and disability is increasing [1,2]. Simultaneously, people are forced to steadily extend their working-lives, since the old-age dependency ratio will rise considerably in the near future [2]. To maintain or improve population health outcomes, the need for healthcare and rehabilitation services is bound to increase [1]. However, contrary to expectations, social and healthcare resources will become increasingly limited [1]. Thus, to respond to the growing demand arising from health and demographic trends, and to maximize the benefits of advances in medicine and assistive technology e-Health [3] including remote therapy [4,5] to promote rehabilitation services are needed [1].

The need for rehabilitation is increasingly acknowledged by laws and formal, written policies as a strategic governance tool to improve and optimise functioning as well as to reduce disability in individuals with health conditions [1,6]. Rehabilitation is typically linked to national health care programmes and the public health services intended to improve physical, mental, cognitive and sensory abilities in functioning across the care continuum and lifespan [6]. Regardless of statutes, there are a lot of inequalities in the implementation of rehabilitation [6] for which targeted resources as well as strategies aiming to ensure promotion of rehabilitation are called [1]. As quickly adopted during

the COVID-19 pandemic, digital technologies can be integrated into the healthcare system as an approach to maximise the efficiency of healthcare delivery [7] including rehabilitation [8-10].

In recent years, technological solutions such as robotic devices, virtual reality devices, games, wearable sensors and tablets have been increasingly utilised in home-based rehabilitation [11]. New technology can provide real-time monitoring of important physiological measurements and other key parameters [12] being useful in target-oriented remote rehabilitation [4]. Technological solutions can enable rehabilitation access equally to people regardless of their residence [4,12,13,] and also motivate people to take responsibility for their own rehabilitation. However, there are still many barriers such as socioeconomic reasons for purchasing devices, technical problems in operation of devices in rural living areas and attitudes towards new methodologies and technology in everyday rehabilitation [14,15].

The aim of this study was to examine the rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process in the North Savo region.

Methods

This study is a part of the North Savo "Expertise and Business Network for Rehabilitation Services in Northern Savo" project (www.kuntoutusosaaminen.fi), implemented by Live Foundation together with the Kuopio Research Institute of Exercise Medicine, the Savonia University of Applied Sciences and the Savo Vocational College. The purpose of the project is to create an operating model for rehabilitation training and services and to increase rehabilitation workers know-how in the North Savo region. In addition, the project will create a business model for rehabilitation training.

The data collection in this study was carried out through interviews [16]. The interviews enabled a wide range of experiences and views of rehabilitation professionals to be presented, and the interviewers were immediately able to ask more detailed and in-depth questions during the interview according to the research method [16-18]. An invitation to participate in the interview was sent by e-mail to public and private health care service providers (n = 50) comprehensively across North Savo region and to various professional groups. Interviewees were sent a written notice of the study in advance alongside a data protection notice. Participants in the interview filled out a background information form. The interviews were conducted by two experienced interviewers according to a pre-built thematic interview framework. From the themes the rehabilitation professionals' experiences related to rehabilitation service system and its functionality, co-operation in rehabilitation and the availability of rehabilitation services as well as skills and training needs related to rehabilitation, only those descriptions were selected which corresponded to the aim of the this study.

The interview proceeded in three stages. First, the study, the course of the interview in general, and the background information of the interviewees were discussed. This first step was taken to create a liberated interview atmosphere [19]. Next, the interview itself was conducted and finally the feelings raised from the interview were discussed.

30 rehabilitation workers aged 24-60 years, 67% of whom were women were interviewed. The participants represented doctors (n=6), physiotherapists (n=1), occupational therapists (n=1), practical nurses (n=5), speech therapists (n=1), assistant physiotherapists (n=1), rehabilitation counsellors (n=2, one working in the third sector), executive directors of rehabilitation unit (n=8), nursing directors (n=1) and social workers (n=1) or they worked in specialists in rehabilitation (n=3). Interviews were conducted during the autumn of 2020, both face-to-face and remotely via Teams, due to the COVID-19 pandemic.

The research material was analysed using the inductive content analysis method, according to which the material was reduced, clustered and abstracted [16,20,21]. The recorded material (total time 27 hours 40 minutes) was listened to and transcribed into 150 pages (Times New Roman, font size 12, line spacing 1.0) of text material. In addition, the text material was anonymised by assigning a number to each interview in sequential numbering. Numbering was used in authentic quotations of results to describe an individual interviewee. In the first step of the analysis, the written material was read several times to form a whole. The material was used to identify the answers to the research question. In this study, the parts of the material in which the participants described their experiences with the technology and e-Health were selected for analysis. Reduced expressions were compared and clustered into subcate-

gories based on content similarity and difference. The next step involved looking at the subcategories and creating content-related top categories. The principal investigator first analysed the data alone, after which the analysis was critically evaluated by the research team. The analysis progressed from subcategories to upper categories and vice versa. The final analysis of the data emerged after several stages of progress.

Results

Rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process in North Savo region formed the following categories: 1) technical problems challenge usage, 2) the cost of technology and digitalisation, 3) the positive impact of COVID-19 on the use of technology and digital services, 4) development of suitable technology and digital services for personalised rehabilitation, and 5) adoption and change in attitudes towards technology through education (Table 1).

Table 1. Rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process at Norther Savo region.

Subcategories	Categories	Main category
<ul style="list-style-type: none"> - Technical problems with remote therapy - In remote areas problems with the network 	Technical problems challenge usage	Rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process
<ul style="list-style-type: none"> - The finances of the individual - The finances of the rehabilitation unit - Savings from digitalisation 	The cost of technology and digitalisation	
<ul style="list-style-type: none"> - Distant work and digitalisation during the Covid-19 time - Resistant of technology - As a result of the Covid-19 time, the technology will spread to wider use in rehabilitation 	The positive impact of COVID-19 on the use of technology and digital services	
<ul style="list-style-type: none"> - Development of individual rehabilitation technology - Research based technology and robotics development - Efficient and effective network connections 	Development of suitable technology and digital services for personalised rehabilitation	
<ul style="list-style-type: none"> - Additional training to use of specific rehabilitation technology - Training lowers the threshold to try - Attitudes change with the user experience 	Adoption and change in attitudes towards technology through education	

Technical problems challenge usage

Interviewees regarded the potential of rehabilitation technology and digital services as enormous, but the use of technology regarded problems and challenges as self-evident. The problems focused on particularly remote therapy rehabilitation, which was perceived to have problems with the functionality of the systems, their suitability for their intended use and the efficiency of the computers. In remote areas, the problems in remote network operation challenge the use of digital rehabilitation services. One participant described this as follows:

“If there is a person so distant and whose computer relies on a 5G wireless network, then with current technology, the level of connectivity may vary too much which causes users gray hair.” (H19).

The cost of technology and digitalisation

Digital solutions and technology for rehabilitation were considered expensive. The interviewees highlighted the financial opportunities of individuals to purchase and use technology. From a cost perspective, the financial opportunity for rehabilitation units to acquire new technology and digital systems emerged. In addition, the financial capabilities of municipalities were perceived to vary. Technology, such as robotics, for more especially demanding rehabilitation was considered expensive. One interviewee discussed the issue from a family perspective.

“How low-income families: nowadays, a computer doesn’t cost much, but still costs so much that there are a lot of families without computers. A mobile phone is not enough for therapy.” (H19).

On the other hand, the interviewees highlighted the long-term savings brought about by expensive investments in technology and digitalisation. Re-

habilitation through virtual games was also seen as an economically viable and an effective method of rehabilitation. Digitalisation was also seen as enabling financial savings in terms of working time, when a therapist's working time is not being spent on transitioning between the workplace and the client's home. One participant described investments as follows:

“... The report showed that robotic rehabilitation brings long-term savings, even though the initial investment is large. Savings specifically in the cost of long-term and institutional care, with the best possible patient self-care. This is desirable for the individual and society.” (H2).

The positive impact of COVID-19 on the use of technology and digital services

Interviewees especially felt that the COVID-19 era underlined virtual possibilities. Rehabilitation workers have become accustomed to distant work and digital communication during the COVID-19 era. During the COVID-19 era more time, energy and money have been saved and, rehabilitation workers have been able to undergo training in a various virtual training, and test different technologies for digital services delivery. This was perceived to have increased skills in using digital services at work and lowered the threshold to attempt the production of various digital services.

“The virtual potential is huge when you know where technology is going – COVID-19 emphasised the potential of virtual possibilities. Very strong evidence we do not have yet, but little by little ... Why not rehabilitation in acute phase in part using virtual technology especially for those who do not need a lot of help (when the injury is so small), but require rehabilitation.” (H29).

The interviewees felt that the pandemic had increased the production of digital services and the use of technology. While revenue from services has increased, digital resistance has decreased. Interviewees felt that because of the COVID-19-era, technology and digitality in rehabilitation were spreading more widely than they were before the COVID-19-era. When rehabilitation services had to be produced digitally, for example remote therapy, experience was gained, and it was perceived that the technology works and that it is mastered. However, the interviewees pointed out that during the COVID-19-era, software has been more widely used, which has facilitated the production of digital services.

Development of suitable technology and digital services for personalised rehabilitation

Technology was considered an essential part of surviving in everyday life. The development of technology so that it would be more personalised and suit users better was considered important, especially for this reason. Newly developed technologies and digital services must be easy to use and motivating to users.

Research-based development of technology and robotics was deemed as a requirement in rehabilitation. Interviewees highlight that more research and evidence of effectiveness is needed for new technologies. Similarly, in the development of robotics, the question arose as to how robotics could be used to motivate and remind the patients, for example, of *"sufficient number of repetitions"* (H2).

The promotion of digital rehabilitation services continued to focus on the development of efficient and functional telecommunications connections. Participants also critically considered the vulnera-

bility of the telecommunications network, as one participant described:

"We have built a society where substantially efficient telecommunications connections have started to be as important as sewer operations: if it collapses, life becomes difficult." (H19).

Adoption and change in attitudes towards technology through education

Interviewees emphasise the importance of education in achieving high-quality digital rehabilitation. New technology and the use of digital systems requires training in a specialty. Training was noted to support the initiation of providing digital rehabilitation services and to enabling the expansion of content and methods of digital rehabilitation services. In addition, training was needed to improve the effectiveness of digital rehabilitation services and to verify competence and understanding. Two participants described the education and technology as follows:

"The field of rehabilitation is wide. Technologies have come there. Specific expertise in a specific field must be acquired through additional training." (H27).

"It works, but still needs some training to gain that powerful effect from therapy that happens in normal situations." (H13).

Both rehabilitation clients and workers have suspicions about technology and digital rehabilitation services. Interviewees stated that clients have doubts about the functionality of the technology, before starting remote therapy services. As the digital service gained user experiences, doubts about client services diminished. The same was observed among rehabilitation workers, as one participant stated: *"Remote rehabilitation seems to work in many situations, where it was previously*

considered that it would be unsuccessful." (H19). In addition, participants highlighted how customers did not want to take full advantage of the digital services.

Discussion

The aim of this study was to examine the rehabilitation professionals' experiences related to eHealth and technology in the rehabilitation process in the North Savo region. The main findings were 1) technical problems related to remote rehabilitation, 2) rehabilitation technology costs, 3) the effect COVID-19 has had on the use of rehabilitation technology and services, 4) development of individualized technology and services for personalised rehabilitation, and 5) education enabling positive attitude change towards technology.

Remote rehabilitation is target-oriented use of technology and applications [4], but can sometimes be perceived as a limited, less effective version of face-to-face rehabilitation. Therefore it is of utmost importance that issues regarding technical availability, stability and feasibility of the systems does not exacerbate the issue. According to the study results, remote rehabilitation systems must be stable, suitable for their purpose and be able to withhold an adequate performance threshold, to function as intended. If these rehabilitation technology does not function as intended, the effectiveness of the provided rehabilitation services may be significantly compromised. Problems regarding technical difficulties were exacerbated during the COVID-19 outbreak, as the only means to carry out rehabilitation was through remote connections [3,4] – effective use of which has thus far been limited [9].

Another topical aspect regarding rehabilitation technology, is its cost-effectiveness as well as availability [1,2]. Even though the income gap

between citizens in Scandinavia is relatively narrow, rehabilitation clients from low-income families may experience difficulties in attempting to purchase computers, iPads, and other electronic equipment necessary for effective remote rehabilitation. This problem is exacerbated especially in demanding rehabilitation, where the technology costs e.g. regarding virtual and robot-technology may be even greater [22]. Even though social care in Finland provides citizens with a certain amount of support – and support regarding remote rehabilitation equipment could prove to be a positive difference-maker – bureaucracy regarding governmental decision-making is slow and the problem is unlikely to disappear in the near future.

According to our study results, rehabilitation workers perceive that investments in rehabilitation technology and digitalisation (e.g. virtual solutions and robots) can provide cost savings in the long run [4]. Our findings indicate that digitalisation and remote technology can better the availability of human resources, which can amount to significant cost-savings. By not having to travel as much, employees can allocate their resources more efficiently and directly into rehabilitation. This is especially important in rural areas in Finland, where there is limited access to rehabilitation care and specialists. Two main human factors, designing for engagement and designing for the home environment, are considered when designing home-based technologies to the rehabilitation [11]. Furthermore, development of robots enables their better use in ergonomically difficult work tasks and enable employees to focus their energy on other, perhaps more creative work tasks. However, there is a mixed consensus on whether or not technology, such as inclusion of assisting robots, can in fact increase the level of autonomy of the rehabilitating clients [10,23].

According to the study, COVID-19 has increased opportunities for the utilisation of virtual systems. During the COVID-19 outbreak, rehabilitation professionals were forced to resort to remote rehabilitation systems as a replacement for face-to-face rehabilitation. Rehabilitation workers have been accustomed to remote rehabilitation and digital communication. The pandemic has also increased the amount of self-organised training and opportunities for learning about new technologies for providing digital services for rehabilitation. COVID-19 has also increased the usage of digital and remote services. Resistance towards digital and remote solutions has concurrently decreased. This may be, due to the fact, that both rehabilitation professionals and customers have been forced to experiment with digital and remote systems – something that would probably not have happened without the outbreak of COVID-19. Being forced to depend on new digital and remote systems ultimately builds trust in these new methods and creates a routine for using them [5,7,8,10,24].

According to our study, individualised, customised, and digitalised rehabilitation solutions for rehabilitation have been viewed as important, perhaps even as in evident progress that will eventually actualize. However, in order for these solutions to become commonplace, their feasibility, usability and stability and the service concept itself must be top-notch [24,25]. This, in turn, requires technological innovation and development. Utilizing robotics for personalised rehabilitation can – at least in theory – improve motivation of the rehabilitators. However, research proving the effectiveness of these new technological innovations has also been requested, alongside efficient data connections.

According to our research, a major factor concerning the technological impact of rehabilitation sys-

tems is the engagement of rehabilitation workers. If they are not keen – or even willing – to use the technological systems, the effectiveness of rehabilitation may be dramatically compromised [11]. According to research by Johnston (2016) the scope of work tasks assigned to rehabilitation workers is wide – as is the difference in their attitudes towards implementation of technology [14]. Some may be conservative in their views and believe the only way to carry out efficient rehabilitation is through face-to-face contacts. On the other hand, some may be keen to experiment with new technological solutions. Likewise, the attitudes of rehabilitation clients towards technology has a dramatic effect on the outcome of rehabilitation [15]. Even if the rehabilitation professionals do everything in their power, it may prove to be ineffective if the rehabilitating client does not have the motivation to engage in remote rehabilitation.

Our study results indicated that new technologies and digital systems among rehabilitation still possess numerous challenges. First of all, they demand training and education – needs of which vary widely. For instance, generic training may be enough to access basic remote rehabilitation systems and databases but performing professional rehabilitation via remote systems usually demands specific, even intensive training. Moreover, in order to ensure the effectiveness of digital and remote rehabilitation, emphasis must be placed on proper education [26-28]. Another significant challenge for remote and digital rehabilitation systems are the attitudes of both rehabilitation professionals and customers. Suspicion, prejudice, and unwillingness have been common attitudes among rehabilitating customers getting familiar with the system. However, after the outbreak of COVID-19 – having large sample-sizes of rehabilitation workers and clients getting accustomed to new remote

and digital systems has eliminated many of the manifesting (oftentimes negative) preconceptions.

Reliability and ethics of research

The study followed the ethical guidelines of good scientific practice. Interview permission was requested from the management of each organisation. The opinion of the Ethics Committee was not required as it was not a medical study [29] and the interviewees were not asked for sensitive information. The interviewees received a bulletin and a data protection notice [30]. Consent was defined as answering the background information survey and participating in the interview. Participants were aware of the possibility of suspending their participation at any time. The study factored in data protection principles and the material was reported in such a way that individual respondents are not identifiable [31].

The reliability of the study was examined according to the concepts of credibility, confirmability, reflexivity and transferability [16,32]. The research team included experienced researchers and rehabilitation experts with work experience in the field from various rehabilitation organisations. This facilitated the understanding of the phenomenon under study. The research material was carefully studied, and the analysis and results of the material were critically reviewed in the research group. The results of the study were compared with previously published research results to increase confirmability. Authentic quotations have been used in reporting the results to increase the credibility of the interpretation. The aim was to involve the interviewees from different professional groups and from different parts of North Savo region, so

that the interviews would achieve the widest and most in-depth picture of rehabilitation from the region. The reflectivity of the research material is increased by the diversity of different professional groups. The transferability of research results is strengthened by describing the collection, analysis and results of research data openly and clearly, which helps the reader to assess the applicability / generalizability of research results to other areas in Finland. The weakness of the study is the partially selected material; experts could not be interviewed from every municipality in northern Savo. Neither length of work experience nor description of technological environment in North Savo was not available. The abstract of this research has been published in the 26th Finnish national Conference on Telemedicine and eHealth conference book [33].

We concluded that the ever-evolving field of rehabilitation demands effective eHealth applications and processes alongside highly competent rehabilitation professionals to meet the needs of the aging population base in North Savo region. The questions relate to the technical problems, costs, more individual technology, and services are solvable with future development work. The effect of COVID-19 has had positive effect on that development work. By bringing together rehabilitation and ICT expertise in North Savo region, it is possible to provide training and education to raise the level of both the rehabilitation processes and level of expertise of rehabilitation workers in the region.

Conflict of interest

The authors declare that there are no conflicts of interest.

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