

Design Requirements for a (Tele-) Rehabilitation Platform: Results from a Participatory Process

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Motivation

Telerehabilitation has equal effects as conventional (in-person) rehabilitation on activities of daily living, motor function like balance or upper limb function [1] [2]. Thus, it has the potential to act as a supplement to conventional rehabilitation pathways of stroke patients or as an alternative, depending on the requirements of the patient

Digitally supported therapy does come with a variety of advantages:

- ✓ independence in terms of location of patient and therapist
- ✓ saving of travel times
- ✓ a better integration into everyday life of patients
- ✓ motivation of the patient and thus the therapy success can be fostered by serious games and giving feedback about quantity and quality of performed exercises
- ✓ better adherence to therapy as the patient has a congruent and traceable path of therapy [3]

The project REHA2030

Interreg V-A Slovenia-Austria project, January 2019 – June 2022

Aim of the project:

- to exploit the potential of telerehabilitation
- to define and evaluate the essential components, structures and features of such a system that is usable in different settings of the rehabilitation process
- following a participatory human-centered design process

Main project activities and outcomes:

- Development of a customized service model for telerehabilitation after stroke that covers requirements imposed by the Austrian and Slovenian healthcare ecosystem
- Development of a technical demonstrator that enables therapy conduction according to the service model
- Real-life demonstration to evaluate acceptance factors and user experience

Methodology

Human Centered Design (HCD)
EN ISO 9241-210:2019

The HCD process, which is iterative by nature, was spitted into two main loops:

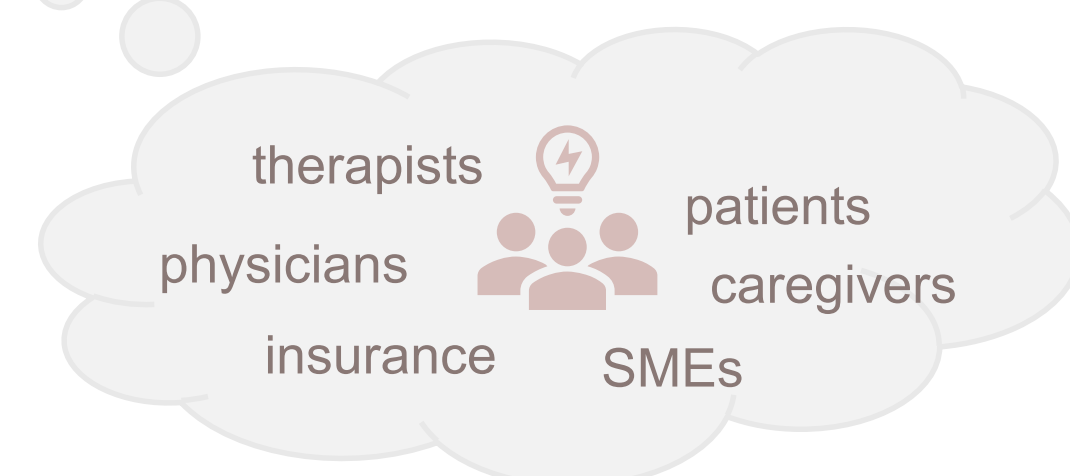
I) Rehabilitation pathways

“analyses the conventional rehabilitation paths and barriers in this supply chain in Austria and Slovenia”

II) Therapist-patient interaction

“focuses on the therapist – patient process for defining process steps, elements, features and their interrelationships for achieving this seamless supply chain and high-quality therapeutic interventions supported by telerehabilitation”

Plan the human-centered design process



(D) Evaluating the design

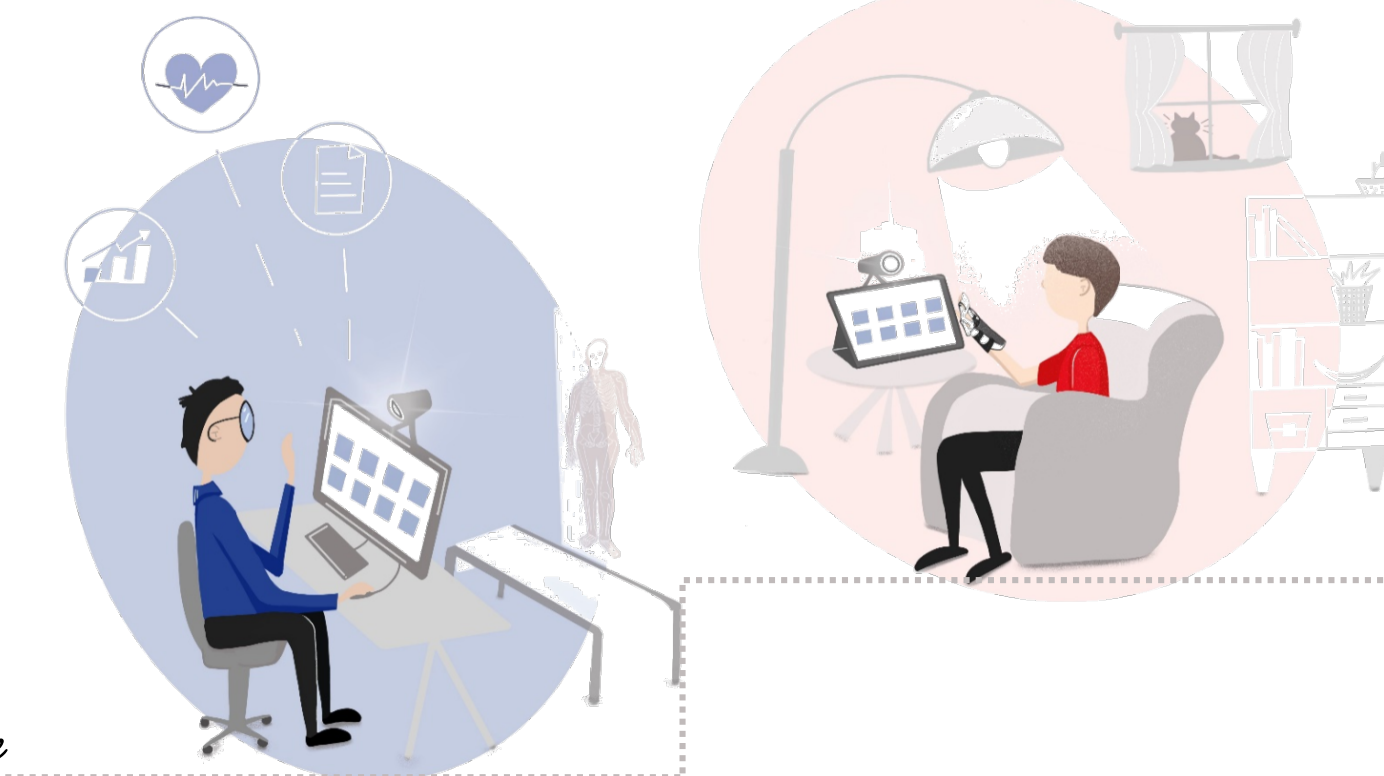
Feasibility in different institutions and settings

Lab, semi-lab and real life evaluation

(A) Understanding and specifying the context of use

Conventional rehabilitation pathways

Therapist-patient interaction process



(C) Producing design solutions

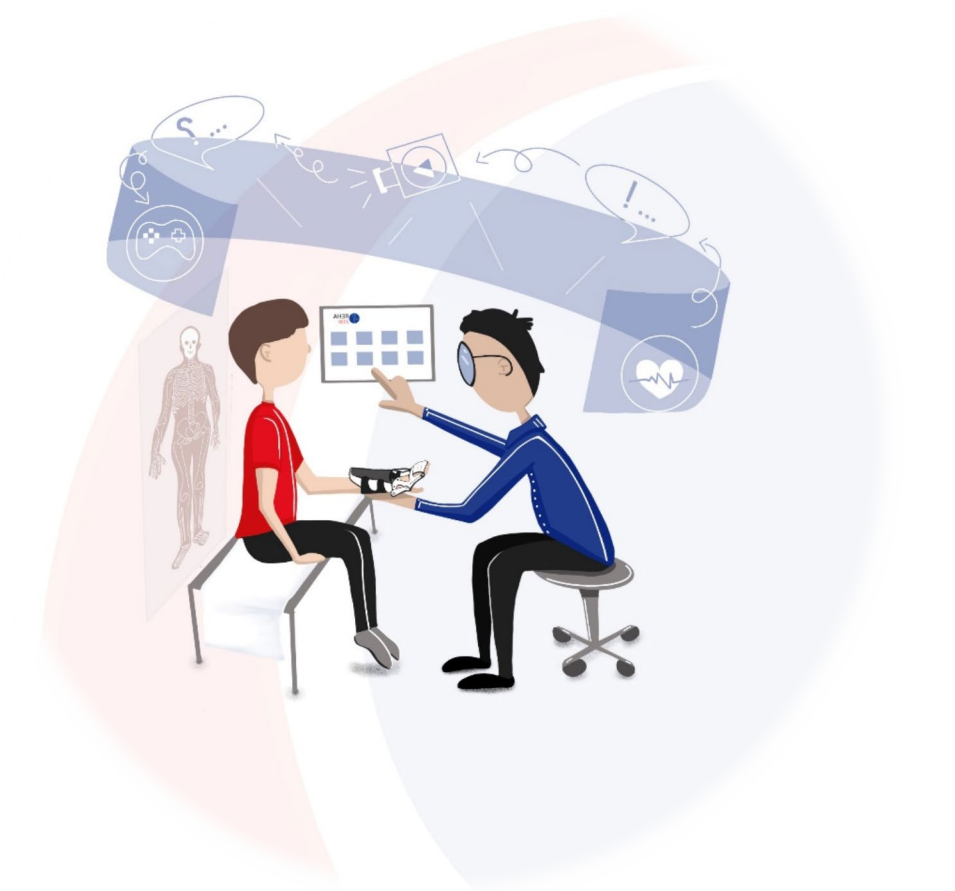
Potential clinical and outpatient (tele-) rehabilitation process and technical concept

Mock-Ups and first prototypes up to demonstrator

(B) Specifying the user requirements

Gaps and disruptions in service provision in relation to user's needs

User Interface elements & functionalities for consistent interaction and communication



Results

The main results of the REHA2030 project are:

- ✓ **A service model** that supplements the conventional rehabilitation path of stroke patients by including tele-therapeutic aspects in an individual way
- ✓ **A technical platform** with tablet and REHA2030 app for the patients and a web-based user interface for the therapists to cover the whole therapy process; therapy devices can be connected with the tablet (e.g. sensor-based device Pablo from Tyromotion)



Characteristics of the service model and technology platform:

- ✓ different settings: clinical setting and provision of outpatient therapy or freelance therapists
- ✓ High flexibility in setting up different session types: face-to-face, synchronous and asynchronous
- ✓ Modularity and transdisciplinary usage: one device for the patient and transdisciplinary usage by all professions, with the possibility to set up and share exercised and to connect different therapeutic devices or apps like serious games according to individual needs

Components of the technical solution for therapists and patients:

- 1. Patient data administration:** personal data, assessments, therapy goals and plans
- 2. Exercise program:** tailored exercises or programs, scheduled in the calendar, with images or videos, device supported exercises, serious games
- 3. Activity monitoring:** statistical data and visualization of conducted exercises, success rate (games) or measured parameters (e.g. hand force from Pablo)
- 4. Communication:** video call and chat function
- 5. Feedback and diary:** direct feedback on the daily condition and the exercises and a private diary for the patient
- 6. Therapy reporting:** regular documentation and semi-automatic creation of therapy reports

Discussion and Conclusion

Applying the HCD approach crossover two countries with differing standard process was time-consuming and required intense communication between the development and research teams. Through these iterations it was possible to design a system that fulfills requirements for freelancer therapists as well as clinical therapists who provide outpatient therapy and is applicable in Slovenia and Austria. To further improve the patient journey and the communication about patient progress between a rehabilitation clinic and freelance therapists after discharge from the clinic and also in case of a repeated stay, the interconnection with hospital information systems was of high importance. This requirement could not be implemented in the scope of the project, but will be taken into account for future activities. Currently, the REHA2030 demonstrator is tested in a small-scale, real-life field trial with five patients and seven therapists over a period of five to ten weeks. In this trial, the user experience of all involved users is evaluated and detailed feedback about integrability in daily life and therapy processes and acceptance based on a long-term usage is gathered.

References

- [1] J. Chen, W. Jin, X.-X. Zhang, W. Xu, X.-N. Liu, and C.-C. Ren, "Telerehabilitation Approaches for Stroke Patients: Systematic Review and Meta-analysis of Randomized Controlled Trials," *Journal of Stroke and Cerebrovascular Diseases*, vol. 24, no. 12, pp. 2660–2668, Dec. 2015, doi: 10.1016/j.jstrokecerebrovasdis.2015.09.014.
- [2] K. E. Laver, Z. Adey-Wakeling, M. Crotty, N. A. Lannin, S. George, and C. Sherrington, "Telerehabilitation services for stroke," *Cochrane Database of Systematic Reviews*, vol. 2020, no. 1, Jan. 2020, doi: 10.1002/14651858.CD010255.pub3.
- [3] C.-M. Lyu and L. Zhang, "Concept analysis of adherence," *Frontiers of Nursing*, vol. 6, no. 2, pp. 81–86, Jul. 2019, doi: 10.2478/FON-2019-0013.

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<https://forschung.fh-kaernten.at/reha2030/>

