



D4.3 Real-life evaluation results

Project Number	2018-5-46-CP
WP Number	4
WP Title	Evaluation & Impact Assessment
Type	Report
Dissemination Level	Public
Version	V3.0
Delivery Date	30 April 2022
Author	Lotte Schokking (NFE), Simone de Graaf (NFE), Marijke Broekhuis (RRD), Lex van Velsen (RRD), Kira Oberschmidt (RRD), Julia Fritz (TERZ), Stefan Kroll (TERZ), Isabel Karlhuber (LFTL), Michael Gstöttenbauer (LFTL)
Internal Reviewer	Stephanie Jansen – Kosterink (RRD)



Version History

Version	Date	Author	Partner	Description
Vo.1	14-07-2021	Simone de Graaf	NFE	Table of content
Vo.2	18-01-2022	Simone de Graaf	NFE	Input of: <ul style="list-style-type: none"> - RRD – SH - NFE – SF - LFTL – SF - TERZ – SF
Vo.3	09-03-2022	Simone de Graaf	NFE	<ul style="list-style-type: none"> - Introduction - Small remarks RRD - Adaptations SH / SF LFTL - RRD – conclusions SH NL - NFE- conclusions SF NL - TERZ – SH
Vo.4	05-04-2022	Simone de Graaf	NFE	<ul style="list-style-type: none"> - TERZ conclusions - Overall conclusions - Discussion
V1.0	14-04-2022	Simone de Graaf	NFE	<ul style="list-style-type: none"> - LFTL- SH, conclusions and small adaptations. - Adaptations in overall conclusions and discussion.
V1.1	26-04-2022	Simone de Graaf	NFE	<ul style="list-style-type: none"> - Adaptations based on internal review
V2.1	30-4-2022	Simone de Graaf	NFE	<ul style="list-style-type: none"> - Adaptations based on internal review

Table of Content

Version History.....	1
1 Summary.....	3
2 Introduction.....	4
Part A: Real-life evaluation results of SALSA Health.....	5
3 Introduction and use cases.....	5
3.1 Objectives.....	5
3.2 Use cases.....	5
3.2.1 The Netherlands: Older adults with COPD who follow physiotherapy programs.....	5
3.2.2 Austria: Ageing workers at the computer workplace and in the home office.....	5
3.2.3 Switzerland: People of 55 years or older.....	5
4 Methods.....	6
4.1 Study design.....	6
4.1.1 Changes in study design: the Netherlands.....	6
4.1.2 Changes in study design: Austria.....	6
4.1.3 Changes in study design: Switzerland.....	7
4.2 Measurement instruments.....	7
4.3 Participants and recruitment.....	8
4.3.1 The Netherlands.....	8
4.3.2 Austria.....	8
4.3.3 Switzerland.....	9
5 Results.....	10
5.1 The Netherlands.....	10
5.1.1 Demographics.....	10
5.1.2 Results – therapists.....	11
5.1.3 Results – patients.....	20
5.2 Austria.....	29
5.2.1 Demographics.....	29
5.2.2 Results – therapists.....	29
5.2.3 Results – participants.....	33
5.3 Switzerland.....	40
5.3.1 Demographics.....	40
5.3.2 Results – therapists.....	40
5.3.3 Results – patients.....	44
6 Conclusions SALSA Health.....	49
6.1 Netherlands.....	49

6.2	Switzerland	49
6.3	Austria	49
Part B: Real-life evaluation results of SALSA Fun		50
7	Introduction and use cases.....	50
7.1	Objectives.....	50
7.2	Pilot sites	50
7.2.1	The Netherlands: Oldstars.....	50
7.2.2	Austria: Walking sports	51
7.2.3	Switzerland: Stand-up peddle and Qigong	51
8	Methods	52
8.1	Study design	52
8.1.1	Changes in study design: Netherlands.....	52
8.1.2	Changes in study design: Austria	53
8.1.3	Changes in study design: Switzerland.....	53
8.2	Measurement instruments.....	53
8.3	Participants and recruitment.....	54
8.3.1	Netherlands.....	54
8.3.2	Austria.....	54
8.3.3	Switzerland	55
9	Results.....	56
9.1	The Netherlands	56
9.1.1	Participants / demographics	56
9.1.2	Use	58
9.1.3	Usability	62
9.1.4	Workflow efficiency.....	66
9.1.5	Quality of training	67
9.1.6	Quality of life and physical fitness	67
9.1.7	Willingness to pay	68
9.2	Austria	69
9.2.1	Participants / demographics	69
9.2.2	Use	69
9.2.3	Usability	70
9.2.4	Workflow efficiency.....	70
9.2.5	Quality of training	71
9.2.6	Quality of life.....	72
9.2.7	Willingness to pay	72

- 9.3 Switzerland 73
 - 9.3.1 Participants / demographics 73
- 10 Conclusions SALSA Fun 74
 - 10.1 Netherlands 74
 - 10.2 Austria 74
 - 10.3 Switzerland 74
- 11 Overall conclusions 75
 - 11.1 SALSA Health 75
 - 11.2 SALSA Fun 75
- 12 Discussion 76
 - 12.1 SALSA Health 76
 - 12.2 SALSA Fun 76
- 13 References 78
- 14 Appendix 1 – Demographic data senior participants SALSA Fun - NL 79

List of tables

Table 1 Evaluation use cases.....	3
Table 2 Responsible partners for SALSA evaluation per country and per system (Fun or Health)	4
Table 3 Overview measurement instruments for patients.....	7
Table 4 Overview measurement instruments for physiotherapists	8
Table 5 Demographics of physiotherapists	10
Table 6 Demographics of patients	11
Table 7 Usability problems (T1).....	15
Table 8 Usability problems (T3)	17
Table 9 Usability problems (T5)	18
Table 10 6MWT scores on T1 and T3	23
Table 11 Score on 5XSST, CCQ and MRC Dyspnoea for T1 and T3.....	24
Table 12 CSQ score per participant.....	24
Table 13 Scores of the EQ-5D-5L per participant per measurement moment (T1, T5)	25
Table 14 Usability issues T2 (patients)	27
Table 15 Usability Issues T3 (patients).....	27
Table 16 Usability Issues T5 (patients)	27
Table 17 Demographics of participants.....	29
Table 18: Values	34
Table 19: Positive Health Questionnaire dimensions for all time points. Values are represented via median [min, max]	35
Table 20 Graphical representation of the Positive Health Questionnaire dimensions for alle time points. Charts representing minimum, median and maximum values for each time point.....	36
Table 21: Positive Health Questionnaire sum scores for all time points	37
Table 22: EQ-5D-5L - Health related question score for all time points	37
Table 23 Exergame Enjoyment Questionnaire sum scores for the time points T2 and T3	37
Table 24 Client Satisfaction Questionnaire sum score for the time point T3.....	37
Table 25 SUS sum score for time point T2 and T3	38
Table 26 HUBBI answers for time points T2 and T3, Values are represented by median (min, max)	38
Table 27 Demographics of patients.....	40
Table 28 Usability problems (T1)	43
Table 29 Usability problems (T3)	43
Table 30 EQ-5D-5L	45
Table 31 Overview measurement instruments for senior participants.....	53
Table 32 Overview measurement instruments for trainers.....	53
Table 33 Demographic data trainers	56
Table 34 Demographic data trainers.....	57
Table 35 Drop out numbers after each measurement moment	58
Table 36 Outcomes System Usability Scale questionnaires.....	62
Table 37 Usability problems.....	63
Table 38 Preferences trainers	64
Table 39 Summary of EQ-5D-5L questionnaires and 6 minutes walking test.....	67
Table 40 SUS scores	70
Table 41 Usability problems.....	70
Table 42 NGSES scores	71
Table 43 Missing functionalities.....	71
Table 44 Preferred functionalities of the app by participants	72
Table 45 Summary of EQ-5D-5L questionnaire	72

List of figures

Figure 1 Overview study SALSA Health evaluation	6
Figure 2 Average scores of positive health per measurement moment (T1 and T5)	23
Figure 3 Visualization of the average HUBBI scores per usability category	26
Figure 4 Average scores of positive health per measurement moment (T1, T3, T5)	45
Figure 5 SUS scores T3	46
Figure 6 SUS scores T5	46
Figure 7 HUBBI scores T3 & T5	47
Figure 8 Overview study SALSA Fun evaluation.....	52

Symbols, abbreviations and acronyms

5XSST	5 times Sit to Stand Test
6MWT	6 Minute Walking Test
ASM	Athletic Skills Model
CCQ	Clinical COPD Questionnaire
COPD	Chronic Obstructive Pulmonary Disease
CSQ	Client Satisfaction Questionnaire
D	Deliverable
DoW	Document of Work
HUBBI	eHealth UsaBility Benchmarking Instrument
EEQ	Exergame enjoyment questionnaire
LFTL	LIFEifetool
MRC	Medical Research Council (MRC) dyspnoea questionnaire
MIRA	MIRA
NET	Netural
NFE	National Foudation for the Elderly
OS	Operating system
QALY	Quality Adjusted Life Year
QoL	Quality of Life
RRD	Roessing Research and Development
SES	Socio-economic status
SUP	Stand-Up Peddle
T	Task
TAM	Technology acceptance model
TERZ	Terzstiftung
TRL	Technology Readiness Level
UAS	University of Applied Sciences
VAS	Visual analogue scale
WP	Work package
YOU	YouToo

1 Summary

This deliverable describes the results of the real-life evaluation pilots for SALSA Health and SALSA Fun. To evaluate the SALSA service, we focused on the perceived added value of the system for the primary end-users physiotherapists (SALSA Health) and sports trainers (SALSA Fun), and the effect the system has on an active and social lifestyle and quality of life (QoL) among the older adults.

Due to the different nature of the two SALSA services, a different evaluation approach for each system was used. The evaluation took place in three countries (the Netherlands, Austria and Switzerland). In Table 2, the different use cases for each pilot in each country are presented including the responsible partner for the evaluation of the system in their country.

Table 1 Evaluation use cases

	The Netherlands	Switzerland	Austria
SALSA Health	People with COPD	People that are 55 years or older	Ageing workers at the computer workplace and in the home office
	RRD	TERZ	LFTL
SALSA Fun	OldStars walking sports	Stand-up peddle, Qigong, seniors' gymnastics	Walking sports
	NFE	TERZ	LFTL & YOU

The SALSA Health evaluation showed that initially patients and therapists were enthusiastic to use the application. The potential of the system was mainly seen in using it at home to support self-management of the patients and keep them active outside therapy. This was also studied in the Austrian evaluation.

However, this enthusiasm diminished during the use over a longer period of time. Main factors were usability issues, arrangement of exercises, long-term motivational incentives and lack of newness in the exercises. Technical problems marred the overall user experience. In addition, in order to make the SALSA Health system fit for use at home, the system should be more intuitive and self-explaining. It should be easy to use and free of inconsistencies.

Similar to SALSA Health, the SALSA Fun evaluation showed that the platform in its current form has too little added value and is not mature enough to be implemented in practice in the Netherlands. First of all, the older adults at all pilot sites did not see the added value of such a platform compared to their current means of communication with each other via social media and WhatsApp.

Secondly, trainers did see some added value for the platform e.g. subscription tool to manage participants (Austria) and sharing exercise videos amongst trainers (Netherlands). However, there are still many usability issues and missing functionalities that need to be solved before the platform can be used. Achieving these developments get complicated since trainers and clubs did not show any willingness to pay for the platform.

2 Introduction

The SALSA service has been developed to promote physical activity among older adults and lower some of the barriers for them to engage in physical activity. The SALSA system consists of two services: SALSA Health and SALSA Fun:

- SALSA Health is developed for physical therapy / rehabilitation purposes. Physiotherapists implement the system within their care setting. It consists of a web application and a Kinect-based system for exergames, called the MIRA system. With the web app, where physiotherapists can add their patients to the system and send them exercise videos and exergames that they can do at home. Also, they can add their patients to groups for group rehabilitation trainings and use the platform to communicate to the group. The MIRA system can be installed in the training room of the physiotherapy practices and can be used as part of the exercise schemes of older adults (both individual or in group setting), depending on the most suitable service model configuration. With these exergames, the rehabilitation therapy can be made much more fun and motivating for the patients.
- SALSA Fun is developed for preventive purposes. It is a platform for older adults to find group sports activities in their local neighbourhood and for sports trainers to learn more about setting up trainings for older adults. The sports activities are specifically designed for the senior population (55+), to make sure that it is inclusive for a large group of older adults, including those with (chronic) health problems. In addition, there will also be a social component added to these groups, such as a coffee moment afterwards of social events, to stimulate social contact between the members.

To evaluate the SALSA service, we focused on the perceived added value for the system for the primary end-users physiotherapists (SALSA Health) and sports trainers (SALSA Fun), and the effect the system has on an active and social lifestyle and quality of life (QoL) among the older adults. As the intended purposes, use cases and contexts of SALSA Health and SALSA Fun are quite distinct from each other, these systems were evaluated separately.

Both systems were evaluated in three countries (the Netherlands, Austria and Switzerland). In Table 2, the responsible party for the evaluation per country per system are displayed. Each country had its own use case in which the system was evaluated. These use cases are described in paragraph 3.2 (SALSA Health) and 7.2 (SALSA Fun).

Table 2 Responsible partners for SALSA evaluation per country and per system (Fun or Health)

Country	SALSA Health	SALSA Fun
The Netherlands	RRD	NFE
Austria	LFTL	LFTL & YOU
Switzerland	TERZ	TERZ

This deliverable contains the research results for SALSA Health and SALSA Fun. In part A, the research results of SALSA Health are explained, and in part B the research results of SALSA Fun.

Part A: Real-life evaluation results of SALSA Health

3 Introduction and use cases

3.1 Objectives

The main objective of this study is to examine the perceived added value of SALSA Health for physiotherapists to use during (group) rehabilitation therapy. In addition, we want to examine if SALSA Health can support older adults in an active and social lifestyle and heighten their QoL either as part of physiotherapy or as a standalone tool after physiotherapy.

3.2 Use cases

From the service model design and business case development, four main use cases for older adults were identified for SALSA Health: Fall prevention, lower back pain rehabilitation, cardiovascular rehabilitation and chronic obstructive pulmonary disease (COPD) rehabilitation. For the evaluation of SALSA Health we focus on one patient group, namely older adults with COPD. This was done for several reasons. First, this is a group that needs continual physiotherapy. As this evaluation will last for 6 months, they are a suitable group for this study as we can measure their progress over the whole course of this study. In contrast, cardiovascular rehabilitation programs have, at least in the Netherlands, a duration of six to eight weeks. Second, using one patient group means we can use all time and effort to add and improve the content in SALSA Health for the COPD use case. Last, having one (homogeneous) patient group will improve statistical power.

3.2.1 The Netherlands: Older adults with COPD who follow physiotherapy programs

In the Netherlands, SALSA Health was implemented during group physiotherapy for older adults (55+ years) with COPD. The pilot site was a physiotherapy practice in Enschede, a city in the east of the Netherlands, where people with COPD are treated during group rehabilitation sessions. Each group consisted of 8-10 people. This group came once or twice per week to the physiotherapy practice and following circuit fitness training in the practice's training room under supervision of a physiotherapist that is specialized in lung/COPD rehabilitation. The MIRA system was installed in the training room and used by the patients as an additional fitness tool during the circuit training, only by indication of the physiotherapist. The physiotherapist used the SALSA Health platform to send group members individualized exercises that he or she can perform at home as a supplement to the group training at the physiotherapy practice.

3.2.2 Austria: Ageing workers at the computer workplace and in the home office

Contrary to the original planning (older adults with COPD who follow physiotherapy programs) SALSA Health was finally tested in the setting of prevention with healthy workers 55+ at the computer workplace in the office and in home office. Suitable physiotherapy programs were defined by a physiotherapist and sent to the participants who had been equipped with the SALSA Health @home system (Laptop and Orbbec camera). A SALSA Health@physiotherapy system was additionally set up at the office for exercising at the work place. The performance was monitored by the therapist and adapted to the special needs of the participants during the pilot phase.

3.2.3 Switzerland: People of 55 years or older

In Switzerland, SALSA Health was tested as in Austria in one-to-one sessions. It was not tested within group trainings. In addition to possible general exercises, participants received individual exercises from the physiotherapist that were tailored to individual needs. This should increase the success of the training and accelerate the rehabilitation.

4 Methods

4.1 Study design

An observational longitudinal study for 24 weeks with repeated measurements and a mixed methods approach was carried out following the evaluation protocol described in deliverable 4.2. During this study a cohort of COPD patients was followed for a period of 24 weeks while using SALSA Health during their regular visit to their local physiotherapist. In total there were five measuring moments, T1 (pre-test), T2, T3 (mid-term), T4 and T5 (post-test). COPD patients were asked to complete questionnaires and to perform a physical test at T1, T3 and T5. Next to this they were invited for interviews at T1, T2, T3, T4 and T5. The physiotherapist completed a questionnaire at T1, T3 and T5 and were asked to participate in a focus group on these measuring moments. Figure 1 shows the general study design.

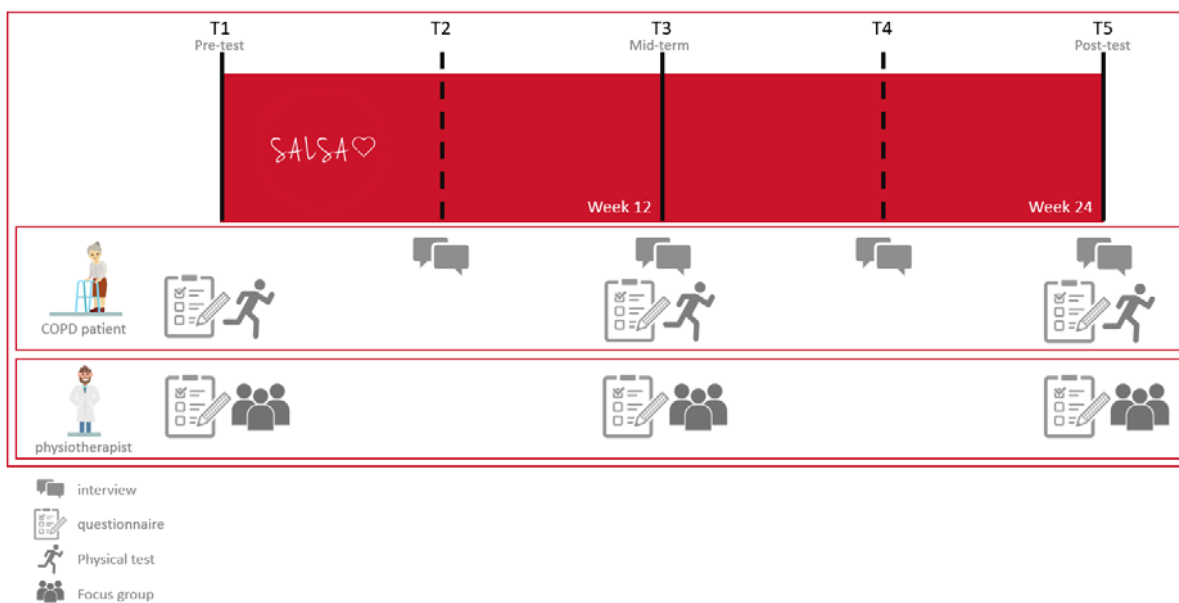


Figure 1 Overview study SALSA Health evaluation

4.1.1 Changes in study design: the Netherlands

Due to long holidays and illnesses of older adults with COPD, the six-week intervals were sometimes too short for participants to talk about their latest experiences with the SALSA Health system. Therefore, we decided to remove T4 and merge the interview questions with the interview guide of T5. Furthermore, at the start of the study many participants had difficulty installing the home account of SALSA. Because of this, we decided in an early stage to not include the home account in our study design. Therefore, it was not necessary to administer two times questionnaires about the same system (at the clinic) at both T3 and T5. It was decided to remove the T3 questionnaires and only ask those questionnaires only at T5.

4.1.2 Changes in study design: Austria

The University of Applied Sciences for Health Professions Upper Austria was subcontracted to support the recruitment and conduct of the pilot study in Austria. Recruiting of physiotherapy practices and participants however was very challenging especially due to the ever changing Corona measures throughout the year 2021. Early in 2021 a clinic for patients with respiratory diseases in Wels was found but it unfortunately had to withdraw their commitment due to staff shortages. A replacement was found in summer with a rehab center in Bad Schallerbach.

First trainings and presentations were done and all was ready prepared to start in fall but the ethical approval was still missing. This was ultimately denied as the new medical device regulations, which are strictly executed in Austria, came to full effect at that time and thus SALSA Health is considered a medical device, which instead requires a medical study to be conducted for evaluation. The alternative plan of conducting the pilot-evaluation with healthy older adults 55+ within rehabilitation was also rejected by the ethics board following the same argumentation. Therefor the shift to healthy older adults (55+), as well as the realization of the testing in the area of prevention, represented a necessary adjustment.

With not much time left it was ultimately decided to do the pilot with ageing workers at the computer workplace and in the home office. The participants were equipped with the SALSA Health @home system, including laptop and Orbbec camera. A SALSA Health@physiotherapy system was additionally set up at the office for exercising at the work place. The pilot duration was reduced to 4 weeks and three measurement points (pre-test, mid-term and post-test) using all questionnaires except the medical ones (CCQ, MRC dyspnea) and the fitness tests (6MWT, 5XSST), thereby only focusing on user experience and user satisfaction. A physiotherapist created the exercise programs and supervised the participants during the pilot phase.

4.1.3 Changes in study design: Switzerland

The field test took place with 5 test persons with non-medical inclusion criteria and two physiotherapists (joint answering of questionnaires). Difficulties of recruitment mainly related to long-term motivation, which was tried to solve by holding bi-weekly conference calls. No deviations from the measurement times, but a short reduction of the final study period meaning that the final questionnaire was collected a couple of weeks before the originally intended collection because the physiotherapist dropped out due to an accident (not related to SALSA), so there was no further monitoring by her.

4.2 Measurement instruments

For the full description of the questionnaires used in this study, please read D4.2.

Table 3 Overview measurement instruments for patients

		Patient group	T1	T2	T3	T4	T5
Demographics	questionnaire	COPD and 55+	x				
HUBBI	questionnaire	COPD and 55+			x		x
Usability issues	interview	COPD and 55+		x	x	x	x
TAM	interview	COPD and 55+		x	x	x	x
Positive Health	questionnaire	COPD and 55+	x		x		x
EQ-5D-5L	questionnaire	COPD and 55+	x		x		x
CSQ	questionnaire	COPD and 55+			x		x
CCQ	questionnaire	COPD patients only	x		x		x

MRC dyspnoea questionnaire	questionnaire	COPD patients only	x		x		x
6MWT	physical test	COPD and 55+	x		x		x
5XSST	physical test	COPD and 55+	x		x		x
Willingness to pay	questionnaire	COPD and 55+			x		x

Table 4 Overview measurement instruments for physiotherapists

		T1	T2	T3	T4	T5
Demographics	questionnaire	x				
Usability issues	focus group			x		x
TAM	focus group			x		x
TTF	focus group			x		x
Workflow	focus group			x		x
Willingness to pay	questionnaire			x		x

4.3 Participants and recruitment

4.3.1 The Netherlands

The study population will be a cohort, consisting of older adults who are 55 years or older and diagnosed with COPD and physical therapists who organize and supervise group COPD rehabilitation sessions.

In order to be eligible to participate in this study, a COPD patient must one of the following criteria:

- Fifty-five years of age and older
- COPD diagnosed by the general practitioner
- Following on a regular base supervise group COPD rehabilitation sessions

In order to be eligible to participate in this study, a physical therapist must one of the following criteria:

- Entitled to practice as physical therapist following the BIG-register maintained by CIBG on behalf of the Dutch Ministry of Health, Welfare and Sport
- Supervise group COPD rehabilitation sessions

A potential subject (COPD patients and physiotherapist) who meets any of the following criteria will be excluded from participation in this study:

- Not able to read and speak Dutch or English
- Not willing to give informed consent
- Not having a pc or laptop at home or having no Internet connection at home

Given the explorative character of this study, we aim to include a total of 5-10 older adults (group members) and 2-3 physiotherapists.

4.3.2 Austria

Eight participants and one physiotherapist were recruited to participate in this health promotion project. Participants were recruited within the staff of LIFEtool GmbH and its network.

Participants were:

- healthy adults between 47 and 60 years of age
- employee of the LIFEtool GmbH
- working regularly in home office

Furthermore, participants were excluded from participation, if they:

- have health issues, that make safe participation impossible

In order to be eligible to participate in this study, a physical therapist must meet the following criteria:

- Entitled to practice as physical therapist following the Austrian physiotherapist register.

4.3.3 Switzerland

terzStiftung is already working with a physiotherapy center in other projects. These relationships were used to recruit and test SALSA Health. In the pilot, a physiotherapist participated with her physiotherapy course participants.

5 Results

5.1 The Netherlands

5.1.1 Demographics

A total of three therapists and seven COPD patients participated with this study.

5.1.1.1 Therapists

Three physiotherapists participated in this study, two female and one male therapist. Participants A and B are similar in age (25 and 26) and years of work experience as a physiotherapist (5 and 4,5 years). Participant C is older (44 years) and has five times longer work experience as a physiotherapist (25 years) than her younger colleagues. They are all specialized in three or more patient groups. All three have a specialization in cardiovascular therapy and lung rehabilitation. Table 5 shows the demographics of the physiotherapists.

Table 5 Demographics of physiotherapists

Participant ID	Gender	Age	Years of work experience	Specialisms
A	Male	25	5	Cardiovascular therapy / lung rehabilitation / neurology / medical fitness
B	Female	26	4,5	Cardiovascular therapy / lung rehabilitation / neurology / oncology
C	Female	44	25	Cardiovascular therapy / lung rehabilitation / medical fitness

All three physiotherapists are involved in group training sessions for lung and COPD patients. Their work involves organizing the group training sessions, assigning clients to the groups, determine frequency of group training session per patient, creating training schedules for the group members, being present at the group training sessions and being the first point of contact for their members.

5.1.1.2 About the physiotherapy practice

The physiotherapy practice that took part in this study is located in Enschede, the Netherlands. The practice has between 10-50 employees. It offers group training sessions as an addition to individual consults and individual training sessions. On average, there are approximately 18 group training sessions per week, an average of 6 group training sessions per day.

5.1.1.3 Group training sessions for lung patients

Group training sessions for lung patients are offered 4-7 times per week. The physiotherapy practice currently still offers group training sessions, despite the ongoing COVID-19 pandemic. Because of the pandemic, they had to reduce the group size from 8-10 patients to 5-6 patients. The following patient groups can partake in the group training sessions for lung patients: COPD, asthma, lung cancer, pulmonary fibrosis, pulmonary embolism, pneumothorax, transplantations. A lung patient visits the group training session once per week on average, sometimes more often. The frequency of which a COPD patient visits group training sessions differs between once per month to multiple times per week.

5.1.1.4 Patients

A total of seven participants took part in this study, five (71.4%) male and two (28.6%) female. They were all 55 years or older, with an average age of 63.4 years. Six (85.7%) participants had a GOLD status of 2 (moderate COPD) and one (14.3%) had a GOLD status between 3 (severe COPD) and 4 (very severe COPD). Four (57.1%) participants were diagnosed with COPD 4-8 years ago, one (14.3%) participant was diagnosed less than 1 years ago, one (14.3%) participant was diagnosed 1-2 years ago and one (14.3%) participant was diagnosed more than 12 years ago. Three (42.9%) participants completed a vocational education, three (42.9%) participants a lower vocational education and one (14.3%) a primary education. All participants had a smartphone, five (71.4%) participants had a PC/laptop, two (28.6%) had a tablet and one (14.3%) participant also had a game computer.

Table 6 Demographics of patients

Participant	Gender	Age	Educational level	Digital devices	Years diagnosed with COPD	GOLD status
1	Male	65	Lower vocational	PC/laptop, smartphone	4-8 years	2
2	Male	74	Vocational	Smartphone	4-8 years	2
5	Female	66	Lower vocational	PC/laptop, smartphone, tablet	4-8 years	2
6	Male	55	Vocational	Smartphone	1-2 years	2
7	Female	63	Primary education	PC/laptop, smartphone, Wii Sports	< 1 year	2
8	Male	64	Vocational	PC/laptop, smartphone	4-8 years	2
9	Male	57	Lower vocational	PC/laptop, smartphone, tablet	>12 years	3-4

5.1.2 Results – therapists

5.1.2.1 Motivation

T1: The physiotherapists gave five reasons to participate with this pilot study:

- 1) Innovation as one of the core values of the physiotherapy practice
- 2) Making it more fun to exercise for patients
- 3) Offer a variety of fitness options for patients
- 4) Improve competitive advantage by being innovative and forward-looking.
- 5) Being able to offer exercises for home environment

Participant A said: *“We deem it important to keep innovating at our practice, that we can offer something new to our lung patients”*. The physiotherapists indicated that they believe it is important to keep an eye out on the future, to see what will be developed and what is useful for them. Also, they liked to mix it up with the exercises for their patients, offering more creative or different exercises so it becomes more challenging. Last, they wanted to make it more fun for patients to train at their facility.

T3: The system asks a lot of the therapists: they have to be always present in order to make sure the patient can train with SALSA Health. If patients want to know how many points they scored compared to last week, the therapists have to look it up in the system. So the patient cannot do anything with SALSA Health on its own. This makes both therapists and patients less motivated to use SALSA Health. The therapists noticed that COPD patients are less motivated to use SALSA Health compared to other patient groups. For example, participant C said: *“Generally, people in a wheelchair like it more than other patients to use SALSA Health, because a lot of other exercises are not available for them. So for that patient group, it really is an added value”*.

T5: In the last months of the pilot study, the use of SALSA Health had gradually become less. The therapists noticed a reduced interest among their patients to use the system and this also lowered their motivation to keep using and promoting it. Participant A said: *"If at a certain moment the patients use it less or do not ask for SALSA Health, then yes, you (therapist) also use it less"*. The therapists mentioned that a competitive elements lacks in SALSA Health, they believe this could improve motivation among patients for a longer period of time. Another reason for the reduced interest is that after a couple of weeks or months, you as a user know the games and exercises well. While at the beginning, it is nice to exercise in a new way, once you are familiar with the exergames and are always doing the same exercises, it becomes routine and thus less motivating to use it.

5.1.2.2 Workflow efficiency

Fit between Individual and Task

The topic 'Fit between individual and task' describes the fit between the individual user or user group (patients or therapists) and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment (T₁, T₃, T₅) and end this section with a general discussion.

T₁: The physiotherapists were enthusiastic about SALSA Health. They believed it to be an added value for their treatment programs for COPD patients. SALSA Health is offered to COPD patients with varying degrees of severity. Instead of the GOLD status, the physiotherapist focusses on the burden of the illness for the patient. For example, if the patient has frequent exacerbations. Patients who are too ill, were excluded from SALSA Health

The therapists created individual training sessions for each patient, with a duration of 10 minutes and with a new exercise every 2 minutes. This way, it fits within the circuit training of the individual patients, as it is an additional fitness tool they can use. The patients train with SALSA Health at the beginning or end of their training session. The system for the physiotherapy practice (the Kinect version) was well received among the patients in the group training sessions. Other patient groups also wanted to train with SALSA Health. Participant B: *"You notice that patients become enthusiastic if other people train with the system, also people of other target groups, without COPD."* The therapist then let's them play with the system using a standard training program of another patient. The therapists believed a competitive element could further heighten patient engagement, as long as privacy is guaranteed.

Some critique by the therapists was that currently, they have to spend more time with patients using SALSA Health in comparison to patients who use the standard fitness equipment. This is caused by that SALSA Health is currently not suitable for people to use it independently, they need the help of a physiotherapist. Participant A: *"We need to support people more and I believe that if you have such a system, patients need to be able to independently use the program."* In subsection 5.1.2.3 'Usability' we highlight current functional problems patients and therapists are experiencing with the system.

T₃: After using SALSA Health for three months, the physiotherapists were less convinced about the added value of the system for treatment process for COPD patients. As participant B said: *"At the start, we were to enthusiastic, in the sense that we hoped that the patients would be able to use it independently (...) but now it becomes clear that this is not the case"*. There are three main issues with SALSA Health that prevent optimal support for the work and tasks of the physiotherapists. First, it takes too much time for physiotherapists to create new individualized training programs every week. Because of this, they used the same training scheme's for several weeks. This also causes patients to become less motivated since they do the same exercises every time. Second, patients were not able to independently use SALSA Health. This makes the use of SALSA Health within group training unsatisfactory because physiotherapists need to be constantly present at the SALSA Health system

to support the patients. This means less time for the other patients in a group training. Last, physiotherapists believed especially the home module could be useful, as participant C said: *"Biggest added value would be that patient could use it at home, something that is not working yet"*. However, the home module was the one thing that we could not test because patients were not able to install the system on their computer or laptop. The physiotherapists further indicated that SALSA Health needs to monitor the patient's progress and adjust his or her setting if necessary in order to better support their work procedures.

T5: The therapists did not believe that SALSA Health, in its current form, effectively supports their tasks. They mentioned two main reasons for this. First, using SALSA Health takes up too much of their time. It is all right if at the beginning, one needs more time to get used to the system. However, the therapists noticed that even after six months, the workload and time they need to invest in SALSA Health to run it properly does not decrease. Participant C said: *"Only, we keep spending time (on the system), that time does not decrease and it does not do anything for the patients or for us"*. Second, the therapists mentioned that SALSA Health did not support their needs properly. They wanted a system that supports patients in the home environment. Participant C said: *"If there is a question like how can an eHealth system support us physiotherapists in our processes, than I believe we want an eHealth application in the home environment"*. They believed it would be a nice addition that you as a therapist could monitor how patients are doing at home, also to better guide and support them in self-managing their health.

Fit between Task and Technology

The topic 'Fit between task and technology' describes the fit between the system that is needed to accomplish a given task and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment (T₁, T₃, T₅) and end this section with a general discussion.

T1: The physiotherapists believed SALSA Health to be of added value to the standard training program. The SALSA system is offered as soon as possible to the patient when that patient starts training at the physiotherapy practice. During group sessions, the therapist sets the SALSA Health training schedule for the patient. Then, the patient can for a large extent independently train with SALSA Health. The therapist can then check upon the other patients. On average, a patient trains 10 minutes per session with SALSA Health. The therapists indicated that more of lengthier sessions could be beneficial, but in order do that, there must be more and more diverse exercises available in the system.

The ideal therapy procedure on incorporating SALSA Health to the training program of a patients is as followed:

1. Screening of new patient by the therapist: intake, physical tests and screening of health problems
2. Therapist creates training plan and sets goals for the new patient
3. Therapist creates an exercise schedule for the new patient in SALSA Health
4. Therapist introduces SALSA Health to the new patient. The patient will train with the SALSA Health system a couple of times with a therapist during individual training sessions (without the group). This can be his or her own therapist or a colleague that supervises the group that day.
5. When the therapist believes the patient is ready for group training, the patient joins these groups. The patient can then set up the program by his or herself and train independently during group sessions.
6. The patient is getting used to the group sessions and his or her confidence with exercising is growing. SALSA Health at home is then offered to the patient, which he or she installs. The

therapists is then able to monitor patient's progress and exercises at home via SALSA Health and use that information at the practice (during the group session), to better support the patient.

7. The patient makes good progress (both during group sessions and at home). Exacerbations become less and less frequent.
8. The therapist believes the patient has sufficient knowledge and tools to self-manage his or her health. Supervision by the physiotherapist is no longer needed.

However, there are several factors that hinder this workflow. First, SALSA Health @home is currently not being used by the therapists. They first wanted to get the @Clinic version fully set up and integrated before adding the home accounts for patients. Second, in section 5.1.2.3 'Usability', a list of usability problems is listed that also highlight use problems that inhibit patients and therapists to further use of SALSA Health @home. Examples of these problems are that the therapists believe the monitoring functions for home use are limited, that the Kinect system does not correctly register the movements of the user and that there are problems with the calibration. Last, the physiotherapy practice already uses another online exercise program 'Physitrack', which has a large database of exercises they can send to their patients to do at home. The therapists indicated that the current database of exercises is too limited to offer full-round training programs to their COPD patients.

T3: We presented the physiotherapists the ideal treatment program as they indicated at T1. Participant C said the following: *"In itself it is an ideal plan I believe. Only, with step 5, that they can start the program and train independently, that is where it goes wrong. Look, if the program can truly be used independently, I believe it could be ideal"*. This is something the other therapists agreed on, that the transition from step 4 to step 5 is currently not available since patients cannot use the system independently. Furthermore, they believed SALSA Health cannot prevent exacerbations though it might lead to less hospitalisations.

Other points regarding this topic was that while there is some variation in the exercises, this was less than they would prefer. There should be more exercises focusing on lower extremities. There are a lot of exercises for arms, but these are not really suitable for COPD patients. Also, again, the required presence of the therapists makes it less suitable, since patients cannot select appropriate exercises by themselves. Participant A: *"you spend 5 minutes to practise for one minute"*. However, the therapists believe SALSA Health could become an added value but just not in its current form. Participant C: *"It is just an exercise system. If you want something specific for COPD patients in the home environment, you need to have a complete system in which there a journal, a self-management aspect, in which everything comes together (...) that they can watch a video on what COPD is, that they have to indicate if their health complaints are normal, a weather forecast, an integrated system. Then it will truly support patients."* In other words, the system has to become much more a self-management tool for COPD patients that they can use at home in order to support the treatment procedures for COPD patients.

T5: Same as during the T3 interview, the therapists believed that the most health benefits for patients can be achieved by addressing the home environment. A self-management system that not just provides patients exercises to do at home but also includes other factors they need to manage their health (like health information) is in their opinion essential. Participant C said: *"You can say that the patient needs to be in control (about his or her health) but if the patient lacks a basis and is not offered any facilities to self-manage his or her health, than the system keeps on failing, meaning that the patient will always receive support too late which causes hospital admissions and other misery"*. Basically, it means that the current form, implementing SALSA Health in the physiotherapy centre, is not sufficient to support patients and therapists. To be of added value, it needs to grow from an exercise system to a self-management system that patients can do at home while therapists can monitor their progress and adjust training plans if necessary.

Fit between Technology and Individual

This category describes comments related to the fit between the system that is needed to accomplish a given task and the individual user or user group (patients or therapists) of that system.

T1: The participating physiotherapists could easily set up the system. Their ability to understand English and good digital skills helped them to quickly learn how to use the system. However, they noticed that their older colleagues had problems with using the system. There is a language barrier, as this older generation has more difficulty understanding English, and there is a digital literacy barrier, as they have more difficulty understanding the user interface the various functionalities and buttons of SALSA Health. The participating physiotherapists believed that if the system is a bit easier to use, with less buttons and options, more colleagues will probably use SALSA Health.

The physiotherapists saw that their patients liked SALSA Health. It made the exercises more purposeful. They can score points and there is a goal. This makes it more challenging for the patient than regular exercises. However, more exercises are needed to make it more suitable for the COPD patient group.

T3: The physiotherapists experience no problems in using SALSA Health. However, they did repeat that only people that are digitally skilled can use it. This means that of the physiotherapists at the practice, especially the younger therapists can use SALSA Health. Their other colleagues use for the most part the training schedules that the physiotherapists in this study have prepared. Also colleagues with less computer skills were able to use these programs.

T5: Similar to the focus groups at T1 and T3, the participants mentioned two main problems on the fit between the technology and individual: (1) people need to have good digital skills to use SALSA Health, and (2) there is language barrier since part of the system is still in English. No new insights on this topic emerged during this focus group.

5.1.2.3 Usability / User Experience

T1: The physiotherapists liked that SALSA Health works well generally. The devices and equipment (TV screen, Kinect, laptop, cupboard) all looked nice and worked well. They had no problems logging into the system or adjusting settings. All exercises were clearly explained and have good visibility on the large screen. The therapists liked that there is a good variety of exercises available.

Although the basics of the system are all considered fine, there is some critique on the usability of SALSA Health. We listed these usability problems here below in Table 7. We discussed with MIRA potential solutions for these issues and to what extent it is feasible to fix these issues before a mid-term software update at T3.

Table 7 Usability problems (T1)

ID	Usability problem	Solution	Available at mid-term software update (T3)?
T1-1	The explanation of the exercises is not in native language (Dutch) but in English	Dutch translations of the exercise explanations (voice overs).	MIRA: We are exploring this with text-to-speech platforms. Tentatively, it could be available in Q3.
T1-2	The supply of exercises in SALSA Health is not aligned with the type exercises for COPD patients (focus on upper extremity while lower extremity is also important for COPD patients and lack of breathing exercises).	The COPD exercise videos need to be transposed into motion-based exercises.	MIRA: Unfortunately, we are not able to bring motion tracking into additional exercises for the time being.

T1-3	Upper extremity exercise movements made by the user seem to be better registered by the system than lower extremity exercises.	The system should correctly register all types of movements of the user	MIRA: Unfortunately, this is very much related to the motion-tracking model we use, Google PoseNet, and we don't have a lot of options to improve in this sense. For future versions/projects, we could explore working with models more accurate in terms of lower body tracking, such as Google MoveNet (which has just recently launched).
T1-4	The system does not offer monitoring functions to receive insights how well a COPD patients is doing while and after training at home with SALSA Health	Adding evaluation questions in the system, to check patients' fatigue levels after home exercise. <ul style="list-style-type: none"> • 'How difficult was this exercise for you?' • 'To what extent do you feel short of breath?' • 'How tiring was this training program for you?' 	MIRA: This is readily available in the system, through support for Custom Questionnaires. Custom Questionnaires can be created in the Settings menu, and they can then be added to the patients' exercise sessions from the Assessment Tools section in the Patient Rehab Session tab, under the Questionnaires item.
T1-5	The range of motion for each individual patient has to be pre-determined per exercise by the therapist.	The system should allow for automatic detection of the range of motion of the patient using the system.	MIRA: Indeed, this is the case with the Kinect (and Orbbec Astra) implementation, where the therapist adjusts the Range setting for the exergames. For future version, but unfortunately not a short term, we aim to automate this process. However, for webcam motion tracking, the system constantly checks the user's maximum range of motion, so in a sense, it does auto-adapt to the patient's performance without the need for external intervention.
T1-6	A patient view is lacking in the Kinect version of the system that is installed in the training room.	Ideally, there is a view within the therapist account in which the patients themselves only have to select their number and that the training schedule for them immediately starts.	MIRA: If the problem refers to the fact that the patient should be able to see themselves while performing the exercises, this functionality is already available in Kinect-based mirror exercises. Bringing mirror exercises to webcam is unfortunately not feasible for the short-to-mid-term.

T₃: Compared to T₁, there are several similar usability issues that therapists mentioned at T₃: (1) there are English instead of Dutch explanations in the system, (2) adjusting the range of motion per patient per game takes too much time, and (3) that the content (exercises) is not really suitable for COPD patients. New issues are that it would be nice if patients could see their own progress. There is an activity log, but only therapists can see that. Also, there is a lot of specialized language, jargon, in the system that is not understandable for patients. Therapists would like it if it was easier to select exercises, not just by themselves but also for patients. These issues prevent patients to use SALSA Health independently. Last, there are several issues with calibration and registration of the camera. This is, by the therapists' opinions, too specific, meaning that patients have to stand on exactly the same spot while performing. When they move a bit, the camera fails to detect them and they cannot finish the game. The therapists believe a solution would be the patient 'wears' the sensors that the camera can pick up anywhere in the room, like with an Xbox Kinect. Then, patients can use the system more freely in the training room without having to remember where to stand.

Table 8 Usability problems (T₃)

ID	Overlap with T ₁ ?	Usability problem	Solution
T ₃ -1	No	A patient cannot see his or her progress, only an overall score per game per session.	Make it possible for patients to clearly see their progress over time: how they performed the previous times they played the same exercise.
T ₃ -2	Yes, T ₁ -1	The voice explanations are in English which makes it difficult for Dutch users to follow the instructions of the system	See Table 7, problem T ₁ -1
T ₃ -3	Yes, T ₁ -5	It takes too much time to adjust the range of motion per patient per game per day for therapists	See Table 7, problem T ₁ -5
T ₃ -4	No	There is a lot of jargon in the system, the patients do not understand that	Separate the patient overview from the therapist overview and make the language in the patient overview easier to understand.
T ₃ -5	No	It should be easier to select exercises	A decision tree would be beneficial for therapists to select exercises. Like: do you want arm or leg exercises?
T ₃ -6	No	Too much calibration is needed before you can start playing the games	The patient 'wears' the sensors, like with an Xbox Kinect that you have controls in your hands that the computer registers.
T ₃ -7	No	Calibration often goes wrong	
T ₃ -8	No	It would be nice if, as a user, you can move more freely in the space while playing the exergames.	
T ₃ -9	No	The user has to keep still on the exactly same spot in order for the system to register the movements. He or she cannot go a little to the front or back.	

T3-10	Yes, T1-2	The supply of exercises in SALSA Health is not aligned with the type exercises for COPD patients (focus on upper extremity while lower extremity is also important for COPD patients and lack of breathing exercises).	See Table 7, problem T1-3
-------	-----------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------

T5: Only two new usability issues emerged during the T5 focus group (see Table 9). The therapists believe that the system should be easier. This could be done by offering only 3-4 exercises and exergames for COPD patients. During the group training sessions, patients should be able to start these exercises by themselves. Furthermore, it would be nice if there was a competitive element, that the patients in a group could compete with each other on the exergames. The therapists believed that this could lead to patients using SALSA Health for a longer period of time.

Table 9 Usability problems (T5)

ID	Overlap with T1 or T3?	Usability problem	Solution
T5-1	Yes, T1-5 and T3-3	It takes too much time to adjust the range of motion per patient per game per day for therapists	See Table 7, problem T1-5
T5-2	Yes, T3-8	It would be nice if, as a user, you can move more freely in the space while playing the exergames.	See Table 8, problem T3-8
T5-3	Yes, T1-2 and T3-10	The supply of exercises in SALSA Health is not aligned with the type exercises for COPD patients (focus on upper extremity while lower extremity is also important for COPD patients and lack of breathing exercises).	See Table 7, problem T1-3
T5-4	Yes, T1-1	The explanation of the exercises is not in native language (Dutch) but in English	Dutch translations of the exercise explanations (voice overs).
T5-5	No	SALSA Health misses a competitive element to motivate and challenge users	There should be an option to compete with other users
T5-6	No	There are too many exercises available	Better would be to offer only 3-4 exercises specifically for COPD patients

5.1.2.4 Technology acceptance

T3: Usefulness: It can support COPD patients if they can use it at home. If you want a system dedicated to COPD patients, it needs to be much broader. One needs a complete system in which the user can self-manage their health, like with a journal, day planning, breathing exercises, etc. A system in which users can find the information they also receive at the practice, so they can go through it once again. The goal should be that COPD patients become aware when their health problems worsen and that they can take actions by themselves to reduce worsening of their symptoms.

Perceived ease of use: For people that have good digital skills, the system is easy to use. However, creating individualized exercise schedules every week takes up too much time for therapists. Therefore, they do not do that.

Intention to use: The therapists indicated that they will continue to use it for the last three months. They will try to get more colleagues involved and also offer the system to other patients besides COPD who are interested. The patients in the study will continue as planned.

T5: Usefulness: The therapists do currently not see the added value and usefulness of the SALSA Health system. The main reason is that a) the ease of use does not get better over time, and b) it currently does not provide some type of benefit for the patient. As Participant C said: *"If by the end it would be beneficial for us, that it is okay to spend more time on it in beginning. However, the time we spend does not get less and it does not add something for the patient. So it does not do anything for us"*.

Perceived ease of use: It takes too much time to start the program for a patient every time and this does not get easier over time and with more experience. This makes SALSA Health not user-friendly for both therapist and patient. This is the main reason why the therapists are currently not using SALSA Health regularly during the group rehabilitation training sessions.

Intention to use: The therapists indicated they would not like to use SALSA Health in its current form after the end of this study. There need to be significant changes made to the system to make it useful for their physiotherapy practice. In the next section, implementation, we discuss how their views towards the long-term implementation of SALSA Health within their practice.

5.1.2.5 Implementation

T1: The physiotherapists in this study have made an instruction video to create awareness and provide information about the SALSA Health system to their other colleagues. One or two other colleagues have been using the system, among the paediatric physiotherapist. However, as a vlog is also a digital medium, they believed it may not have been that suitable for their older colleagues. When a colleague is interested in the system, they talk with the participating therapists about it who then give a demo of the system.

T3: SALSA Health is less used by other physiotherapists. As Participant B said: *"I believe that at the start more people used the system"*. Participant C is testing how the system works for other patient groups. She noticed that people in a wheelchair like SALSA Health and that it is also really suitable for them because SALSA Health has a lot of arm movement exercises. The therapists have created a demo patient so new patients can try it out without having to create a patient file in the system.

For the next few weeks, they will offer SALSA Health more freely to patients that are working out in the training room. They expect that when patients see other patients training with SALSA Health, they will also become interested to use it. Patients in the study will continue with SALSA Health. Furthermore, the physiotherapists want to explore more other patient groups, by motivating colleagues to try out SALSA Health using the demo patient.

On the long run, considerable adaptations have to be made to SALSA Health in order to be useful for the physiotherapy practice. SALSA Health should have the option that multiple people can use it simultaneously so you can offer group training via the screen. Last, Participant C describes in the following quote how she believes eHealth systems like SALSA Health will eventually be implemented within their physiotherapy practice: *"Eventually, we foresee that in our practice there is a corner where you can easily do exercises in front of a screen in which the patient can select what exercises he or she wants to do (...) to offer variety if they want to do something different."*

T5: The therapists were interested to use SALSA Health not in the training room, but in the waiting room of the physiotherapy practice. That there are standard exercise programs containing 3-4 exergames for specific patient groups, like COPD or cardiovascular rehabilitation. Instead of patients that are entered in the system, they would make demo_patients per patient group. For example, a

patient 'COPD'. People with COPD can select that patient and play the exergames independently without the help of a therapist. Participant A: *"If the patient enters, they can go to SALSA Health by themselves, initiate the program, exercise, and continue"*. The most important thing is that the patients can play it independently.

5.1.2.6 Willingness to pay

The therapists were unanimous in their opinion that they currently would not want to pay for SALSA Health as it currently does not meet their needs. Therapist Participant C: *"if you want to offer something to a physiotherapy practice, it has to be interesting for the whole practice. At this moment, there are simpler things/methods that work fine, like the Xbox system."*

5.1.3 Results – patients

5.1.3.1 Motivation

This category describes the reasons that participants give for signing up to the study in the first place (at T₁), as well as their motivation to continue participation over the course of the study (T₂-T₅).

T₁: For a lot of the participants the main reason for signing up was the positive contact and friendly question from the therapists. As Participant 4 pointed out, a generally positive attitude towards research is necessary, but the way the invitation takes place can be the final convincing factor: *"I am favourable towards it, otherwise I would not have signed up. But that's also because they are so kind here, then I gladly participate"*. There was another aspect of this socially motivated participation, namely that participants wanted to help the researchers with their work. It is interesting to note here that while they were of course familiar with their therapist beforehand, the participants did not know the researchers when they signed up.

Additionally, the beneficial outcomes of the research, either for the patients personally, or for COPD care in general, were important motivations for signing up. Since the system is integrated in the treatment, participants expected similar benefits to those of usual treatment, mainly more physical activity and better health that follows from that. Participant 1 described it as follows: *"I know that if it is a bit normal, that I will benefit from it. And then I will also do more at home I think. We are hoping for that"*. However, participants did not only think about their own health. The fact that their participation can help create a system that might benefit future COPD patients was a strong motivator as well.

Lastly, Participant 6 mentioned that curiosity was also part of the motivation for signing up, saying that they are *"always interested in new things"*.

T₂: At the T₂ moment, participants were asked whether their expectations of the research had been met so far. Answers were very mixed. Participant 6, had expected no health outcomes and found some of the exercises to be too intensive. However, at T₂ they said that, regarding their physical improvement due to the system, they were *"becoming more and more positive"*. This was mainly due to the fact that they had made some changes together with the physiotherapist, excluded the exercises they were unable to do. Participant 4 was additionally motivated by the positive mental effect of participation. On the other hand, Participant 5 had higher expectations that were not met in the study. Specifically, they expect the physiotherapists to be more involved and guiding them through the exercises. Additionally, there was no one else in Participant 5's group who also worked with SALSA Health, while they would have liked somebody to discuss the exercises with, also to add a bit of a challenge. Participant 3 was neither very positive nor very negative and explained this with the fact that *"this is not something where you immediately see results. You need to do it for a longer period of time"*. However at the T₃ interview they stated that they had not used the system in a while

and that if they were to do so again it would be because they were asked to and not because they felt the need to do so themselves.

5.1.3.2 Values

T1: The values mentioned in the interviews can very generally be divided into two categories; those values relating to the treatment, and those relating to the therapist and the relationship with them.

With regard to their treatment, patients valued the effectiveness highly. This is highlighted by two quotes from Participant 7 who said *"if I see how much I improved since I started the treatment, that's perfect"* and that *"the result is most important"*. To achieve good treatment results, clear instructions are also important. Additionally, being challenged a bit during the treatment was also valued. Many participants also found the contact with others as one of the most valuable elements of their treatment. Participant 1 described it like this: *"That's nice about a group, that you know each other well. We all have the same problem so to say"*.

The main values related to the relationship with the therapist were involvement and personal support. Factors that play into this involved and personal relationship were described by Participant 3: *"It has to be a therapist that you trust of course and it has to be a therapist who is very approachable and it has to be a therapist who thinks along with you"*. In addition to these factors, enthusiasm and a positive attitude of therapists were also seen as very important.

T2: At the T2 moment, the discussion of values was more extended and structured than during T1. Participants were asked to choose the values they found most important from a pre-made list and relate them to their treatment in general, and SALSA Health specifically.

Four participants expressed that they liked to be challenged in their treatment. SALSA Health brought their competitive side to light as they were trying to beat either the scores of other participants or their own high scores from previous sessions. Participant 4 described how this usually went in his sessions: *"it is a challenge if you remember how many points you had last time. With fun games, like the little fish, I remember what I did. Then say to the therapist 'write that down quickly, next time I need to be first instead of second'. That's a challenge for me, improve the games for myself"*.

Participants also found the quality of care to be an important value in their treatment. On the one hand, this encompassed the therapists experience and how the for example approach patients in the session. On the other hand, for some participants, quality of care was closely related to the next important value, personal guidance. The main aspect of this guidance was to have the physiotherapist present while they were training, with or without SALSA Health. As Participant 3 mentioned, it was good to *"know that you have somebody next to you who also says: you shouldn't do this"*. Personal guidance is also closely related to independence, as Participant 6 describes: *"It is like yin and yang. Depends on personal need. Sometimes I really need guidance. To get started. And sometimes I have already started"*. Some participants generally prefer to be more independent, like Participant 1 who said they *"prefer to be [their] own boss [and] decide which exercises [they] do when"*. Currently participants still needed the physiotherapists to start the system for them, but they assumed that if this was no longer the case, they could be even more independent in their session, if desired.

Results and regularity of the treatment were also seen as very important by some of the participants. The value results related to the fact that participants want to be able to see the effect that their treatment was having on their physical health in general, and specific COPD complaints. As described above, whether this was the case at T2 differed per participant. Participant 7 discussed the value of regularity, and its relation to SALSA Health: *"Every person needs a daily routine [...] That's just a certain regularity, and SALSA fits in there really well for me"*.

For Participant 6, having contact with others was a very important value. When working with the SALSA Health system, they were missing this contact and said that it might be nice to be able to play games together with somebody else.

Participant 5 experienced some problems when it came to the privacy aspects of using SALSA Health at the physiotherapist's office. They described it as follows: *"What I mainly think, talking about COPD, you are always in the same group of people with COPD, but there are also other things that have to do with it and you are not separated. And also with the game, if you can't do something, you immediately get questions about it. But there is a whole group around you. So that's why I am missing the privacy. Because you are not in a separate group. You are in a separate COPD group, but not a separate group with this game let's say"*.

T3: During the T3 interview, both Participant 3 and 5 described their need for personal guidance during treatment. Participant 5 found this especially important with regards to SALSA Health as *"the system says you are not doing it right even though you are standing correctly. [...] You are doing it like on the tv but you are using the wrong muscles and you need to do that right, otherwise you'll have a problem"*. Additionally, Participant 3 mentioned that the therapists can help them in deciding to skip one of the games if it is too hard at that moment. For Participant 3 personal guidance was also closely related to the quality of care.

Another important value for Participant 3 was to see the results of the treatment. With regards to SALSA Health, they expected that maybe this could be achieved by going to higher levels of difficulty in the games and then seeing more results in practice. They also described it as follows: *"If I do an exercise and I am completely tired, or I do the same exercise again and it works better, than I am seeing a result, right?"*.

As in the T2 interview, Participant 5 selected privacy as an important value, but this time with a different reasoning behind it. There had been a mix-up at the physiotherapist's office and they saw screenshots of a different participant in their account. While this was a onetime event, caused not by the system itself but by human error, it nevertheless had an impact on the participant's perceived privacy. The situation made them think that others might be able to see their training, which made them uncomfortable.

T5: In the last interview, the same values as previously were mentioned, with the same reasoning. Participant 6 reported that they had stopped using SALSA Health because they valued contact with others, which was no part of training with the system. They did value the support that the therapist was offering when using the system, for example to motivate them during particularly difficult exercises.

5.1.3.3 Quality of life

Each patient filled out the Positive Health scale at T1 (n = 7) and T5 (n = 5). The reason there are less participants at T5 is because of dropout. We made a radar chart of the average scores per health dimension (physical, mental, spiritual, quality of life, social, daily functioning) for each measurement moment. Figure 2 shows the two radar charts. It shows that participants gave higher scores on spiritual health (8 vs. 7.3), quality of life (8.2 vs 7.1), social health (8.8 vs. 8.4) and daily functioning (8.6 vs. 7.4) at T5 than T1. However, they gave lower scores on mental health (6.6 vs. 7) while physical health remained the same (5.4).

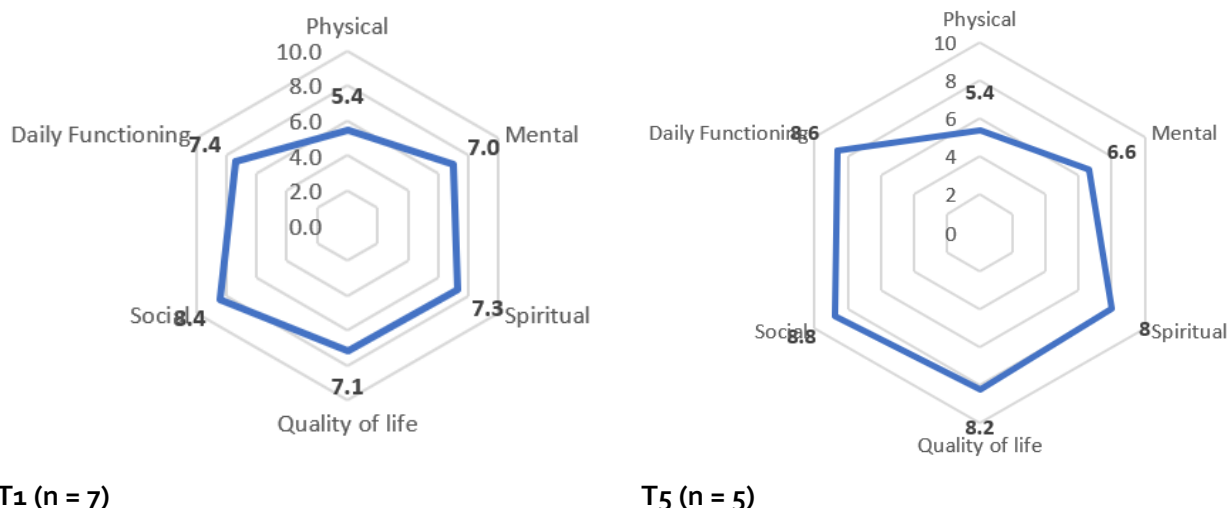


Figure 2 Average scores of positive health per measurement moment (T1 and T5)

5.1.3.4 Physical performance

The physical performance was assessed by mean of two physical test and two questionnaires. The physical test are: the 6-min walk test (6MWT) to assess functional capacity and the Five Times Sit to Stand Test Chair-Stand Test (5XSST) to assess muscle strength of the lower extremity. The 6- MWT is a submaximal exercise test that entails measurement of distance walked over a span of 6 minutes. The 6MWT provides a measure for integrated global response of multiple cardiopulmonary and musculoskeletal systems involved in exercise. The two questionnaires are: Clinical COPD Questionnaire (CCQ) and the Medical Research Council (MRC) dyspnoea questionnaire. The CCQ is a very short survey (10 question) through which COPD patients are requested to recall their experiences during the previous week in regards to their symptoms, functional and mental state. The MRC dyspnoea questionnaire is a practical and validated list to score the degree of dyspnoea that a COPD patient experiences himself. The list is based on the GOLD criteria.

The score on the 6MWT are presented in Table 10. At T1 the average distance on the 6MWT by the seven participants was 353,9 meter [range 293-440]. At T3 only three participants were still in the study and there average score on the 6MWT was 307 meter [range 180 -391]. At T1 the seven participant needed on average 12,2 seconds [range 7,8 – 17,6] to stand up out of a chair for five times. At T3 this average time is slight lower and they the remaining three participants need 11,4 seconds [range 8,7 – 12,8]. Indicating a small improvement (see Table 11). On group level and individual level the scores on the CCQ and MRC dyspnoea hardly change over the two measurement moment (see Table 11). Due to the sample size no further statistical analysis are possible and other conclusion can be drawn.

Table 10 6MWT scores on T1 and T3

	6MWT		BORG		Rest		Active	
	Distance	dyspnoea	fatigue	HF	Saturation	HF	Saturation	
T1 (n=7)								
Average	353,9	4,4	4,6	76,4	96,7	94,0	93,7	
Min	293	0	0	65	93	71	86	
Max	440	7	6	90	99	108	99	
T3 (n=3)								
Average	307,0	6,0	5,0	100,7	93,7	110,3	91,3	

Min	180	5	2	96	86	103	85
Max	391	8	8	106	98	115	95

Table 11 Score on 5XSST, CCQ and MRC Dyspnoea for T1 and T3

	5XSST seconds	CCQ	MRC Dyspnoea
T1 (n=7)			
Average	12,2	2,6	2,6
Min	7,8	1,8	2
Max	17,6	4,1	4
T3 (n=3)			
Average	11,4	2,6	3,0
Min	8,7	1,3	2
Max	12,8	3,9	4

5.1.3.5 Quality of care

Quality of care was measured with the Client Satisfaction Questionnaire (Larsen et al., 1979)¹, with contains eight items. It computes a score between 8 (low client satisfaction) and 32 (high client satisfaction). Table 12 shows the CSQ score per participant. It shows that participants were moderately satisfied with SALSA Health, with the exception of participant 9, who had a score of 29, meaning he was very satisfied with SALSA Health to be used during COPD rehabilitation therapy.

Table 12 CSQ score per participant

Participant	CSQ score
2	16
5	21
7	20
8	23
9	29

5.1.3.6 EQ-5D-5L

The EQ-5D-5L is a standardized instrument that measures the health of a person on five dimensions: mobility, self-care, daily functioning, pain/discomfort and anxiety/depression. Also, the person has to indicate his or her overall health that particular day on a range from 0 (worst health every) to 100 (best health ever) (Janssen et al., 2013)². We measure the EQ-5D-5L on two measurement moments. Table 13 shows the scores per participant per measurement moment.

On T1 the average Quality Adjusted Life Year (QALY-NL for the seven participant is 0,677 [range 0,565 – 0,806], on T5 this average QALY-NL drops to 0,590 [range 0.213-0,799] for the five remaining participants. This drop is also in the Daily Score measure by means of a 0-100 VAS-scale. Given the

¹ Larsen, D. L., Attkisson, C. C., Hargreaves, W. A., & Nguyen, T. D. (1979). Assessment of client/patient satisfaction: Development of a general scale. *Evaluation and Program Planning*, 2(3). [https://doi.org/10.1016/0149-7189\(79\)90094-6](https://doi.org/10.1016/0149-7189(79)90094-6)

² Janssen, M. F., Pickard, A. S., Golicki, D., Gudex, C., Niewada, M., Scalone, L., Swinburn, P., & Busschbach, J. (2013). Measurement properties of the EQ-5D-5L compared to the EQ-5D-3L across eight patient groups: A multi-country study. *Quality of Life Research*, 22(7). <https://doi.org/10.1007/s11136-012-0322-4>

sample size it is difficult to analyse these data on a group level and to perform further statistical analytics.

Table 13 Scores of the EQ-5D-5L per participant per measurement moment (T1, T5)

Participant	T1			T5		
	Health score	QALY-NL	Daily score	Health score	QALY-NL	Daily score
1	33333	0,569	70			
2	41322	0,669	60	31222	0,7	75
5	31331	0,775	70	21222	0,707	80
6	33233	0,575	75			n/a
7	41341	0,565	65	42451	0,213	20
8	22211	0,806	80	32211	0,799	80
9	21331	0,781	55	31441	0,53	36
Average		0,677	67,9		0,590	58,2
min		0,565	55		0,213	20
max		0,806	80		0,799	80

5.1.3.7 Usability / User Experience

5.1.3.7.1 Usability benchmarks

During this pilot study, we administered the System Usability Scale (SUS) (Brooke, 1996)³ and the eHealth Usability Benchmarking Instrument (HUBBI) to participants. Five participants filled out these questionnaires. The SUS provides a single score of the system's usability, ranging from 0 (very bad) to 100 (very good). For SALSA Health, the average SUS score was 64, meaning that the usability is below average (Lewis & Sauro, 2018)⁴ and thus that the system's usability contains serious defaults. The HUBBI does not provide a unidimensional score, but gives a score on seven subcategories of usability: basic system performance, task-technology fit, interface design, navigation & structure, information & terminology, guidance & support and satisfaction.

Figure 3 shows the average scores per category plotted on a spider chart. A score in the green circle indicates that part of the usability is considered good, a score in the yellow circle means it is okay but could be improved, a score in the orange circle means it is not good and a score in the red circle means that part of the system has a very low usability rating. The HUBBI scores on the SALSA Health service shows that the usability is not good. The categories navigation & structure and guidance & support both have an average score of 2.9, meaning they fall in the orange circle. The other categories all remain in the yellow circle with scores between 3.1 and 3.5.

³ Brooke, J. (1996). SUS - A quick and dirty usability scale. In and I. L. M. (Eds. . P.W.Jordan, B. Thomas, B.A. Weerdmeester (Ed.), *Usability evaluation in industry* (pp. 189–194). Taylor & Francis

⁴ Lewis, J. R., & Sauro, J. (2018). Item Benchmarks for the System Usability Scale. *Journal of Usability Studies*, 13(3), 158–167. http://uxpajournal.org/wp-content/uploads/sites/8/pdf/JUS_Lewis_May2018.pdf

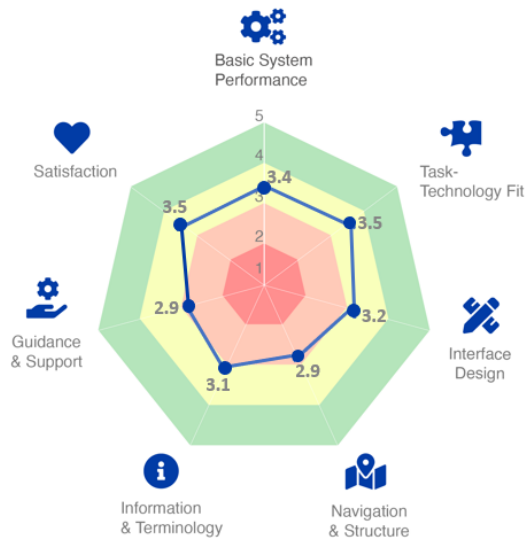


Figure 3 Visualization of the average HUBBI scores per usability category

5.1.3.7.2 User experience

User experience with SALSA Health was measured with the Exergame Enjoyment Questionnaire (EEQ) (Fitzgerald et al., 2020)⁵. This is a 20-item survey that measures how well participants like playing exergames. It provides a score between 20 (very low) to 100 (very high). This questionnaire was only asked at T5. Four participants filled out this survey. The average score was 69, with 65 being the lowest score and 73 being the highest score. This means that the participants moderately liked the exergames in SALSA Health.

5.1.3.7.3 Qualitative remarks on usability per measurement moment

T1: Since most participants had not yet used the system, not much was discussed with regards to usability. However, one participant had trouble with the initial sign-up and commented on this negatively. Additionally, one participant who had already tried the system during a session in the practice found the exercises physically too hard and was not able to follow the program fully. On the other hands, the generally attitude towards the system was that it looked fun.

T2: The participants now had used the system for six weeks. Their opinions and thoughts regarding the usability of the system were mixed. Positive comments were that they liked the exercises and interface design very much. They mentioned that it was nice to do the exercises in front of the television screen. Also, they mentioned that the program is challenging (which they thought to be positive), and that the scores you can obtain in a game make it more motivating to keep exercising. Last, they believed the system to be a good addition to regular therapy if it could be used at home, provided that the home account also included the games.

Negative comments included that the exercises were sometimes too heavy for them, that the system does not always function properly and that not everything is in the Dutch language. There below in Table 14, we listed the main usability issues.

⁵ Fitzgerald, A., Huang, S., Sposato, K., Wang, D., Claypool, M., & Agu, E. (2020). The Exergame Enjoyment Questionnaire (EEQ): An Instrument for Measuring Exergame Enjoyment. *Proceedings of the 53rd Hawaii International Conference on System Sciences*. <https://doi.org/10.24251/hicss.2020.416>

Table 14 Usability issues T2 (patients)

ID	Usability issue	Occurrence
1	The exercises in the system are heavy to do	4
2	The system sometimes falters, the screen does not always respond to the movements made by the user	3
3	The user (patient) cannot start the program by himself. A therapist is required which is considered a hindrance	2
4	The system is not completely in the Dutch language	2
5	The exercises in the system focus too much on muscle and too little on breathing	1
6	The system looks a bit childish	1
7	What is missing is the option to choose the degrees of difficulty, so that one can make the exercises less difficult	1
8	There is no privacy whilst using SALSA Health in the clinic. If you cannot exercise as indicated, the system tells you so.	1

T3: In the T3 interviews, the newness of SALSA Health and the associated excitement had worn off. As Participant 3 put it into words “I liked it very much at the beginning, something new for once”.

Both Participant 3 and 5 mentioned the same usability issues, which are summarized in Table 15. These were problems that had already come up during T2, namely that the system sometimes does not respond to the users’ movements and that users are unable to start the program themselves.

Table 15 Usability Issues T3 (patients)

ID	Usability issue	Occurrence
1	The system sometimes falters, the screen does not always respond to the movements made by the user	2
2	The user (patient) cannot start the program by himself. A therapist is required which is considered a hindrance	2

T5: During T5 the complain that was mentioned by both patients was that they could not use the system by themselves and needed a therapist to set it up. Additionally, Participant 6 would have liked to be able to select exercises themselves. Participant 3 had stopped using the system because it was less accessible than the other exercising machines. Participant 6 was no longer using the system either, because they preferred the social contact during the treatment and exercising with the system did not leave room to chat with others. However, both saw potential in SALSA Health. Participant 3 said that if the system was more accessible, and could be used like the other exercise machines “curiosity is sparked and more people are going to use it”. For Participant 6 the main benefit lay in at home use for less active older adults.

Table 16 Usability Issues T5 (patients)

ID	Usability issue	Occurrence
1	The user (patient) cannot start the program by himself. A therapist is required which is considered a hindrance	2
2	The exercises in the system are heavy to do	1
3	The system sometimes falters, the screen does not always respond to the movements made by the user	1
4	The system is not completely in the Dutch language	1
5	The system looks a bit childish	1

5.1.3.8 *Willingness to pay*

Four out of the five participants that filled in the willingness to pay scale indicated that they did not want to pay for SALSA Health. Only one participant wanted to pay for SALSA Health for an amount of 10 euros per month.

5.2 Austria

5.2.1 Demographics

A total of 1 therapist and 7 participants participated in this study.

5.2.1.1 Therapists

The therapist is female and 45 years of age. She works in a group practice for 5 years and has in total 26 years of experience as physiotherapist with specialization in orthopaedics and traumatology.

5.2.1.2 About the physiotherapy practice

The practice is situated in Linz, Upper Austria, and has between 10 and 20 employees. Patients go there for single therapy sessions (approximately 45 min per session), the practice does not offer group therapy sessions.

5.2.1.3 Participants

A total of 7 participants took part in this study, 5 male and 2 female. One participant stopped the participation after T1 because of illness (not related to the SALSA Health pilot). Mean age is 53.2 (3.7). All participants had a PC/laptop and a smartphone and/or tablet. Table 17 shows the demographic data of the 7 participants.

Table 17 Demographics of participants

Participant	Gender	Age	Educational level
Probo1	Male	53	University
Probo2	Male	56	University
Probo3	Male	47	College/Apprenticeship
Probo4	Female	54	University
Probo5	Female	52	University
Probo6	male	49	University
Probo7	male	54	University

5.2.2 Results – therapists

5.2.2.1 Motivation

T1 (pre-test): The motivation to participate is basic interest in the project, about which she learned through personal contact. She has never been part in a similar project before.

First impression of the SALSA system is that it offers simple exercises that invite imitation. The exergames seem to offer a wide variety of different games. However, the question immediately arises as to how users are corrected during practice. She finds the system to be generally quite simple, although she describes herself as not very tech-savvy. When she tries the first exercise (moving the upper body from the hip), she critically remarks, that without additional instruction it can easily lead to hyperextension of the lumbar spine. Another game (basketball) seems not to work as intended.

T2 (mid-term): Asked about the motivation of the participants and how she tries to motivate them, she answers:

"I create a new programme every week - I try to include all extremities alternately and also one or two cognitive games - it is difficult for me to judge how the participants react to it as I do not know any of them personally and I did not receive any reactions to my email."

From the feedback in the SALSA system she judges, that motivation of participants is between 64% and 78 %.

She reports, that there are always problems with the technical component - in the sense that it doesn't react to some movements. As a consequence, these exercises/games were not used.

She still likes the exercises/games as prophylaxis/for prevention purposes and as movement impulses during a static professional activity. She does not like the lack of contact with the participants - as a therapist it is difficult for her to judge whether the participants are doing it correctly and she did not receive any further feedback from the participants, there is just a participation rate.

The exercises are well understandable and clearly explained - for the older generation, however, she sees problems in understanding the exercise task.

T₃ (post-test): Looking back the therapists describes her experience as trouble-free. She would participate in a similar project again, but would like to see a better level of technical maturity.

She thinks it is a very good idea to use digital media to move around during a predominantly static activity - as this can certainly be built into everyday office life.

She describes the system as "user-friendly", but she experienced technical difficulties with some games - which increased the duration of the creation of programmes as many games did not work. The problem with some games was that the system did not react to certain movements or sometimes not at all.

5.2.2.2 Workflow efficiency

Fit between Individual and Task

The topic 'Fit between individual and task' describes the fit between the individual user or user group (patients or therapists) and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment (T₁=pre-test, T₂=mid-term, T₃=post-test).

T₁: She doubts that a system like SALSA can properly be used in therapy, as for patients the exercises normally are very individual and target specific health problems. However, she can very well imagine such a system for prevention and she sees the need for it. Get people moving is good for the skeletomuscular system.

T₂: The therapist states, that she needs approx. 1-2h per programme creation - as there are always technical problems with individual games. Again she stresses the fact, that in her opinion SALSA can only be used for prophylactic purposes as it is not a therapeutic exercise programme.

For the practice - in the sense of a therapeutic facility - she personally does not see any need as she as a therapist has no influence on the correct execution of an exercise or has no possibility to correct the patient on the spot. For the practice in the sense of prophylaxis in the home office area - without knowing clinical complaint patterns, it is quite reasonable to move 10-15min /day during office work. However, this alone will not be enough to consider it a balanced exercise programme.

"I would not use this programme for patients with clinical symptoms as it is not a physiotherapy exercise and I cannot correct the patients if they do the exercises incorrectly with a computer programme. The use depends on the target patient group: I mainly work in the orthopaedic/traumatological field - that means the patients come to therapy with pain symptoms - I don't see any use for this. But I could imagine a different use in the area of prevention/prophylaxis/geriatrics/internal medicine, where it could certainly bring added value."

T₃: The therapist did not provide an answer (no change compared to T₁ and T₂).

Fit between Task and Technology

The topic 'Fit between task and technology' describes the fit between the system that is needed to accomplish a given task and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment ((T₁=pre-test, T₂=mid-term, T₃=post-test).

T₁: She has never used a similar system before. Asked about how she is planning to use SALSA in the coming weeks she answers:

"I will get into the system and have a good look at all the exercises/games and then create suitable programmes for healthy people at the computer workstation. Several programmes between 15 and 20 minutes to have a bit of variety. When a programme is ready and sent out, I will prepare additional emails to the participants to give even more detailed instructions and warnings for individual movements."

Other than that, she will not actively check with the participants, but will be available for questions about the exercises and problems with them. She does not plan to analyse the evaluations.

T₂: Every week a new programme was created and sent to the pilot participants with more instructions per email, as planned at the beginning. The system was not used with patients or in her practice.

T₃: The therapist did not provide an answer (no change compared to T₁ and T₂).

Fit between Technology and Individual

This category describes comments related to the fit between the system that is needed to accomplish a given task and the individual user or user group (patients or therapists) of that system.

T₁: Asked whether the system is suitable for her, she says it is not for therapy. It is rather suitable for larger rehabilitation centers, where the focus is more on prevention, where group therapies are offered.

It is definitely suitable for health promotion and strengthening of the musculoskeletal system, also for older people, if it is simple enough. It reminds her of "Fit with Philip", a "Join in – get moving" programme on television for older people. But it is rather not suitable for treating patients. She thinks it will be relatively easy to learn how to use it. A helpdesk in case of question will be helpful.

T₂: Asked, whether the system is suitable for individual counselling/therapy, she states that it can certainly be integrated for individual consultations in the area of prophylaxis - in this case as a therapist she knows the individual anamnesis and complaints and can thus select specific exercises that would not harm the patient –

"However, I would like to point out once again that these are only general movements and not specific therapeutic gymnastics."

The same holds true for group therapies.

She confirms that using the SALSA system was easy to learn.

T₃: Can be used quite well in prevention, but I would increase the frequency of movement a little during the individual games in order to achieve better blood circulation in the individual regions.

What do you need to perceive the system as more suitable?

- Improve the technical component
- Incorporate more rounded movements into the games
- Slightly increase the frequency of the movements

5.2.2.3 Usability / User Experience

The therapist was also using the SALSA Health @Home setup with Laptop and Orbbec camera. She never reached out to the helpdesk, but she repeatedly experienced problems with certain exergames/exercises, when she had the feeling, that the movements were not detected. She did not report the problems in detail, but just chose a different game/exercise.

5.2.2.4 TAM

TAM-Perceived Usefulness

The therapist suspects that this 10-15 minute daily programme could bring about a slight significantly noticeable change in the training condition (of course this always depends on the actual condition at the beginning of the training). The frequency of the individual movements within a game are in her opinion too low to achieve an effective increase in blood circulation in the muscles - nevertheless, any kind of movement during a static muscle activity (which is unfortunately the case in everyday office life) is good and thus has a positive effect on our organism.

Asked to what extent she thinks SALSA Health can be used to promote health and strengthen the musculoskeletal system, she answers that exercising always benefits the musculoskeletal system and therefore also promotes health. For patients she does not see how SALSA can support them:

"I would not use this system for patients with clinical symptoms as the movements are too non-specific."

She elaborates that if a patient in physiotherapeutic treatment is given a 10-minute home exercise programme - from her own experience - this is only carried out by patients up to a maximum of 60%. The more exercises the patient is given - the less motivation there is to carry out this programme regularly and also the greater is the susceptibility to errors in the execution itself.

"Less is therefore more in this sense: 1-2 targeted exercises - but these daily and with correct execution."

So again: *"It can certainly be used in prophylaxis - it is not recommended in individual therapy for painful symptoms."*

TAM: Perceived ease of use

SALSA is certainly easy to use in everyday life for the younger generation - for the older generation she sees certain difficulties in using the computer.

TAM: Intention to use

The therapist does not think she will continue to use SALSA Health after completing this pilot study, because:

- the technical component is still too imprecise.
- no possibility to correct the performed exercises individually on the patient.
- exercises are not on a physiotherapeutic basis - Movements are very generic.
- she does not work in the prophylactic field. Therefore, she does not see any use for her practice.
- older generation would have difficulties to do the exercises correctly.
- execution of movements sometimes too slow to achieve an effective increase in blood circulation

5.2.2.5 Willingness to pay

T2: No, as she does not work in prevention and sees no use case in her daily work with patients. She would maybe spend €5-10 in the prevention setting.

5.2.3 Results – participants

5.2.3.1 Motivation

This category describes the reasons that participants give for signing up to the study in the first place (at T1), as well as their motivation to continue participation over the course of the study.

T1: Two mentioned that health is an important topic and another two conveyed a personal interest in scientific studies and new technologies. One stated, that they liked physical activity in general. One participant summed it up as follows:

"Lack of exercise due to a lot of computer work and, in addition, for 2 years almost only online meetings and hardly any meetings with attendance because of the Corona crisis."

T2: The questions "How do you feel about your participation in SALSA Health so far?" and "What do you like about it?" was by most answered in a positive way ("OK", "Motivating"). Mixed feelings and criticism were uttered because of technical problems. Participants liked the physical activities, healthy breaks in the work routine, having new possibilities and a new form of self-organization and also the competition aspect.

They would like to change some things though:

- The recognition of movements does not work as reliably as needed, e.g. one exercise was not doable at all. This was the biggest criticism.
- The audios should be localized to German; some explanations of exercises are not clear enough.
- Some procedures are too fast.
- The laptop screen is too small.
- The leader board is confusing.

Thinking back to the original expectations, the participants are a little bit disappointed. Mostly, because they would have expected a technically more mature product. The motion detection does not always work to satisfaction, which makes exercising cumbersome. One participant finds it amazing to control games with body movements, but thinks on the other hand, that a system like this cannot replace the direct contact and supervision by a physiotherapist. Three participants talked to other people about their experiences. One mentioned other solutions like Nintendo's Ring Fit app and the TV programme "Fit mit Philip".

In terms of time, participants need between 10 and 20 minutes for each session, every second, third day. One participant states that *"Getting physically active is worth the effort."*

T3: Most participants used the system spontaneously as break time during work (at home and in the office). Two participants did the exercises in the evening, when work was over, because they did not find the time during working hours. One of these also stated, that he wanted to do the exercises together with his wife. All others did the programmes alone. Frequency ranged from 1-2 times per week to every second day.

Rating the participation, the following answers were gathered:

"I found it very positive to train the body and thus have a "healthy" change in the home office. My expectations of the system were partly fulfilled."

"Basically interesting, but mostly also tedious. Expectations were rather not met, some programme features were not satisfactory."

"Interesting, entertaining. From the creativity of the exercises yes, from the technical side rather not."

"It would certainly have been a useful application if it hadn't been for the instabilities of the programme and the movement pattern recognition. This was very annoying during some exercises and spoiled the fun of taking part in the study. At the beginning I thought that the system would be more stable. Expectations were therefore not fulfilled or only partially fulfilled."

It was OK, expectations were fulfilled."

The participants exchanged experiences mostly with each other. One also talked to a colleague who works with older people with disabilities, who was interested in the SALSA system.

Regarding the energy cost/ effort, the answers range from "Not much" to "Too much". One found the exercises sometimes relaxing and sometimes challenging. One said, that using the system was frustrating. Time spent was between 15 minutes a day and 105 minutes in total. Half of the participants said, that there were no other impacts, others stated a heightened interest in physical exercises during work time, a good feeling after finishing a programme and a raised activity level.

5.2.3.2 Values

T1: The participants offered a wide range of answers:

- Reliable technology was mentioned twice (*It is important that the technology works well and that I can do everything on my own if possible.*)
- Personal contact was important to two participants, in case of problems and also in a very general sense (time for conversations)
- Privacy was mentioned by one participant and the wish for control that the transmitted data is deleted after the end of the study.
- Trust in the therapist's competence was mentioned once.
- One participant said, that *"A healthy body is generally important, but in the daily routine you often pay too little attention to it and when there are problems, you have the feeling that you lose control."*

Question 2 ("In which moments do you realize, what is important") was not understood by most and only answered by one, stating that e.g. in road traffic control is more important than trust.

T2: Values have not changed since T1. Gathering the proposed values yields the following results:

Table 18: Values

Value	Mentions
See results	5
Challenge	3
Autonomy	3
Privacy	1
Regularity	1
Quality of treatment	1
Personal support	1
Trust	1

Some participants think, that SALSA supports the selected values (e.g. autonomy, see results) whereas some are not fulfilled (like quality of treatment, challenge). Suggestions for improvement are:

- overall technical improvement
- motivating emails
- better contact with physiotherapist and more individually tailored programmes
- better explanation of exercises.

T3: Values and suggestions for improvement have not really changed since T2.

5.2.3.3 Quality of life

The general health status was estimated with the Positive Health Questionnaire and one specific question of the EQ-5D-5L questionnaire. The descriptive statistics of the assessments are illustrated in the following tables.

Table 19: Positive Health Questionnaire dimensions for all time points. Values are represented via median [min, max]

Dimension	T ₁	T ₂	T ₃
Physical	8.5 [8.0, 9.0]	8.5 [6.0, 9.0]	9.0 [7.0, 10.0]
Mental	9.0 [7.0, 10.0]	9.0 [9.0, 10.0]	9.0 [8.0, 10.0]
Spiritual	9.5 [7.0, 10.0]	9.5 [9.0, 10.0]	9.0 [10.0, 10.0]
Quality of Life	9.0 [7, 10]	8.5 [8.0, 10.0]	9.0 [8.0, 10.0]
Social	9.5 [7, 10]	9.5 [7.0, 10.0]	10.0 [8.0, 10.0]
Daily Functioning	9.5 [9, 10]	10 [9.0, 10.0]	9.5 [9.0, 10.0]

As shown in the following two tables the investigated SALSA Health exhibited very high scorings in all dimensions of the Positive Health Questionnaire (participants being active, healthy and presumably overall satisfied with their lives).

Table 20 Graphical representation of the Positive Health Questionnaire dimensions for all time points. Charts representing minimum, median and maximum values for each time point

Time point	Graphical representation of the Positive Health Questionnaire dimensions
T1	<p>A radar chart for time point T1 with six dimensions. The chart has concentric lines representing values from 0 to 10. The dimensions and their values are: Physical (8.5), Daily Functioning (9.5), Social (9.5), Quality of Life (9.0), Spiritual (9.5), and Mental (9.0).</p>
T2	<p>A radar chart for time point T2 with six dimensions. The chart has concentric lines representing values from 0 to 10. The dimensions and their values are: Physical (8.5), Daily Functioning (10.0), Social (9.5), Quality of Life (8.5), Spiritual (9.5), and Mental (9.0).</p>
T3	<p>A radar chart for time point T3 with six dimensions. The chart has concentric lines representing values from 0 to 10. The dimensions and their values are: Physical (9.0), Daily Functioning (9.5), Social (10.0), Quality of Life (9.0), Spiritual (10.0), and Mental (9.0).</p>

Table 21: Positive Health Questionnaire sum scores for all time points

	N	Minimum	Maximum	Mean	Standard Deviation
PHQ_Sum_T1	6	46.00	58.00	53.8333	4.5
PHQ_Sum_T2	6	49.00	59.00	54.3333	4.0
PHQ_Sum_T3	6	52.00	60.00	55.8333	3.4

Repeated measure ANOVA exhibited a statistical trend ($p=0.116$) with high effect sizes (partial $\eta^2=0.660$) towards an increase of positive health questionnaire sum scores over time.

Table 22: EQ-5D-5L - Health related question score for all time points

	N	Minimum	Maximum	Mean	Standard Deviation
EQ-5D-5L-GH_T1	6	80	99	89.00	6.3
EQ-5D-5L-GH_T2	6	80	99	88.33	6.9
EQ-5D-5L-GH_T3	6	80	99	91.67	6.7

Similar to the Positive Health Questionnaire, for the health-related question of the EQ-5D-5L questionnaire (VAS), repeated measure ANOVA exhibited a statistical trend ($p=0.182$) with high effect sizes (partial $\eta^2=0.574$) towards health increments over time.

Despite the fact, that SALSA Health app users exhibited a good health, both health related assessments exhibited statistical trends towards health improvements over time. The consistency of improvements over time and the effect sizes lead to the assumption that the SALSA Health app might be beneficial for health promotion. Due to the small sample size, and the in-house recruitment, this assumption has to be handled with care.

5.2.3.4 User satisfaction

The user satisfaction was assessed via the Client Satisfaction Questionnaire (CSQ-8) and the Exergame Enjoyment Questionnaire (EEQ). As one participant did not answer one CSQ-8 item, the CSQ-8 analyses are only based on five participants. The descriptive results of these questionnaires are illustrated in Table 23 and in Table 24.

Table 23 Exergame Enjoyment Questionnaire sum scores for the time points T2 and T3

	N	Minimum	Maximum	Mean	Standard Deviation
EEQ_sum_T2	6	59.00	68.00	64.8333	3.7
EEQ_sum_T3	6	63.00	77.00	68.1667	5.0

Table 24 Client Satisfaction Questionnaire sum score for the time point T3

	N	Minimum	Maximum	Mean	Standard Deviation
ZUF8_sum	5	15,00	24,00	19,8000	4,1

For the EEQ assessment, paired t-test exhibited a statistical trend ($p=0.083$) with a high effect size (Cohen's $d: -0.883$) towards a time related increment in the EEQ sum score.

On a scale ranging from 8 to 32 point, the mean sum score of the CSQ-8 was 19.8 ± 4.1 for the SALSA Health users.

Based on the experience of the evaluating statistician, both the EEQ and CSQ-8 questionnaire exhibited lower sum scores compared to other eHealth interventions in the medical or therapeutic field.

5.2.3.5 EQ-5D-5L

The quality of life was estimated with the EQ-5D-5L questionnaire, an assessment tool that requires a license to determine the EQ-5D-5L index and non-standardized questions. As no license persists, the analysis of the EQ-5D-5L questionnaire was only based on a solely analysis on each of the five items.

Related to the quality of life no difference has been found in the investigated cohort. As the study cohort was free from moderate to severe health problems, improvements towards higher quality of life parameters were no possible due to ceiling / floor effects. Because of this it can be expected, that the EQ-5D-5L index (which was not part of this analysis) would also not be able to be changed due to the app use. Hence no clear statement towards an improvement in quality of life can be taken. Nevertheless, in none of the EQ-5D-5L categories a decline was found. Subsequently, it can be estimated that the SALSA Health app use did not decline quality of life. Due to the small sample size, and the in-house recruitment, this assumption has to be handled with care.

The analysis of user experience was based on the SUS, the HUBBI and non-standardized assessments. As one participant did not answer one SUS item, the SUS analyses are only based on five participants.

Table 25 SUS sum score for time point T2 and T3

	N	Minimum	Maximum	Mean	Standard Deviation
SUS_sum_T2	5	35.00	72.50	58.0000	16.4
SUS_sum_T3	5	32.50	75.00	57.0000	18.1

The HUBBI Questionnaire exhibited neutral findings for most of the items. Negative experience was mostly related to systems related errors.

Table 26 HUBBI answers for time points T2 and T3, Values are represented by median (min, max)

HUBBI Questionnaire			
Nr.	Statement	T2	T3
1	I experienced system errors while using [the system]	1 [1,2]	1.5 [2, 4]
2	I get stuck when using [the system]	2.5 [1, 5]	2 [1, 5]
3	[The system] is convenient to use at [home, hospital, care centre]	2 [1, 3]	2 [1, 4]
4	[The system] is suitable for me	3 [2, 5]	3 [2, 5]
5	[The system] is helpful to [inform about / prevent/diagnose/treat/monitor] [health condition]	2.5 [2, 3]	3 [2, 4]
6	I can see everything clearly in [the system]	4 [3, 5]	3 [2, 4]
7	The signals, warnings and cues in the system are easy to interpret	2.5 [1, 5]	3 [1, 5]
8	The layout of each page of [the system] is appealing	3 [2, 3]	2.5 [1, 3]
9	The messages in [the system] are well-structured	3 [2, 4]	3 [2, 5]
10	I know where in [the system] I can find the information I need	3 [2, 3]	3 [2, 5]
11	I understand the relationships among the different parts of the system	2 [2, 3]	2.5 [2, 4]
12	[The system] information is easy to understand	3 [2, 4]	3 [2, 4]

13	[The system] offers clear explanations for difficult medical topics	3.5 [2, 4]	3.5 [3, 5]
14	The error messages in [the system] tell me how to fix problems clearly	3 [2,5]	4 [2,5]
15	[The system] sufficiently explains how to perform system procedures e.g. create account, log on, change settings, connect with other devices	2.5 [1, 3]	2.5 [2, 4]
16	[The system] provides sufficient feedback to support me in managing my health	3 [2, 4]	3 [2, 4]
17	Overall, I am satisfied with [the system]	3 [2, 4]	3 [2, 4]
18	I like how [the system] contributes to my health	3 [2, 4]	2.5 [2, 4]

SUS and HUBBI results exhibited usability rated below average. In comparison to the international mean SUS sum score of 68%, the SALSA Health app received only 58% by the SALSA Health users. Interestingly there was a big variation in SUS scores ranging from 35 up to 75%. An explanation of this relatively bad rating might my technical errors. As shown by the HUBBI, every user of the app experienced system error and many of them also got stuck within the app. In addition, nearly every participant complained about the insufficient interaction between the hardware and the software, technical problems, insufficient visibility or software errors.

5.2.3.6 Willingness to pay

Overall, 2 out of 6 people (33.3%) stated that they would pay for the use of the SALSA Health app. Those who are willing to pay for the app, would pay between 5 and 10 € per month for the usage.

Due to the small amount of people that agreed to pay for the SALSA app, it can be expected that the current prototype of the app does not fulfil users' expectations and needs. This assumption is underpinned by low rates of usability and user satisfaction.

5.3 Switzerland

5.3.1 Demographics

The next paragraphs describe the demographics of the therapists, physiotherapy practice and patients.

5.3.1.1 Therapists

For the SALSA health project, the terzStiftung had written to 2 physiotherapy centers, of which one center participated in the end. From the originally planned three physiotherapists, one physiotherapist had actively participated in the end, a second one more passively.

The physiotherapist is an 68 years old female and has been working at the Physiotherapy Center Stein am Rhein for 30 years. In total she works for 43 year as a physiotherapist with specialisms: musculoskeletal physiotherapy, neurorehabilitation and post-operative rehab.

5.3.1.2 About the physiotherapy practice

The Physiotherapy Center Rhytaining in Stein am Rhein is a center where phyiotherapy as well as fitness and group fitness offers are available. It employs 17 people and has a modern equipped equipment room. There are 11 physiotherapy courses and 21 group fitness courses.

5.3.1.3 Patients

A total of five participants took part in this study, one male and four female. They were all 55 years or older, with an average age of 70,4.

All participants have been attending physical therapy for more than three months. They have the middle and higher education degrees. All of them use a computer or laptop at home and a smartphone. Two of the participants also use a tablet. All participants are no longer in paid work and are retired.

They all regularly visit the physiotherapy center for individual training as well as group training. The exercises done within SALSA health were created individually for each participant according to their needs. The participants had physical limitations typical for their age. Their goal was to maintain and improve their physical fitness.

Table 27 Demographics of patients

Participant	Gender	Age	Educational level	Work ability	Digital devices
1	f	71	Higher technical and vocational training	-	Laptop, Smartphone, Tablet
2	f	69	Vocational apprenticeship/school	-	Laptop, Smartphone
3	f	73	Vocational apprenticeship/school	-	Laptop, Smartphone
4	f	69	Vocational apprenticeship/school	-	Laptop, Smartphone
5	m	70	Higher technical and vocational training	-	Laptop, Smartphone, Tablet

5.3.2 Results – therapists

5.3.2.1 Motivation

T1: Why did you decide to participate in the project?

- I enjoy trying out new things
- I am always open to new technologies, after all this is the future.
- I also enjoy supporting projects like this.
- I think it sounds very exciting and we are already using other technical solutions to support patients at home.

The physical therapist indicated that she is very into new technologies related to health and fitness. She is interested in keeping up with the times and adding variety to exercises for patients. Especially with the pandemic, it has become apparent that exercises can definitely be done at home. Here, new solutions are very welcome.

T3: What is (from your point of view) the patients' motivation to continue participating in this study?

- They are open for new things
- We already use similar systems in the practice, with which the patients can do the exercises at home.
- I also persuaded them a little bit to dare to try new things, especially since I am convinced of such things myself
- They are very committed and want to support you, even though they are now no longer convinced of the system.

T5: Already halfway through the field test, the motivation of both physiotherapists and participants waned. The reason for this was that there were still too many inconsistencies in the system that made it cumbersome to use. The therapist mentioned that, on the one hand, the general operation needed to be more handy and, on the other hand, it was difficult to select the right exercises for the participants because the exercises were insufficiently sorted and only one side of the body was trained.

5.3.2.2 Workflow efficiency

Fit between Individual and Task

The topic 'Fit between individual and task' describes the fit between the individual user or user group (patients or therapists) and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment (T₁, T₃, T₅) and end this section with a general discussion.

T1: The physiotherapist, as well as her colleague who dropped in from time to time during the sessions, were very fond of SALSA Health. The physiotherapist herself already works with Exergames and was accordingly enthusiastic about the system. She believes that the playfulness of the system will motivate patients and encourage them to exercise more at home.

What are your first impressions of SALSA Health?

- It looks clear and seems easy to use.
- I like the fact that there are different forms of exercises. I already have experience with Exergames.

T3: After the initial enthusiasm, the system still has room for improvement. It is difficult to keep the participants motivated. Also, the exercises are not arranged in an optimal way. You have to search a lot. It would be better to have categories to select from the beginning and not just the search box.

What do you like/don't like?

Good:

- It is in principle already very extensive and the idea of the different exercise approaches is good. Especially the alternation of games and video exercises is good.

Bad:

- It does not run smoothly yet. The system still hangs up too often and then you don't know what to do.
- Also, it is difficult when you want to set something and it does not work properly.

What feedback on SALSA Health do you receive from your patients?

- They are very restrained with their feedback but it does seep through that they are struggling and motivation is waning because of it.

After using SALSA Health after 3 months, the physical therapist was increasingly disappointed. The initial enthusiasm had given way to frustration. This was partly due to the fact that the system was more time consuming to use than initially thought, which was due to the lack of self-explanation of SALSA Health. This increasingly created a feeling of "it's not working properly". In addition, the patients had greater difficulties with the operation than assumed at the beginning. As a result, they used SALSA Health significantly less.

T5: The last test phase was shorter due to an accident of the physiotherapist. Nevertheless, she gave us as a final feedback that the idea of the system is good, but it still takes too much time, because the already mentioned components are not yet mature. It takes too much time to set the exercises and to keep an overview. However, she still found the basic idea exciting.

Fit between Task and Technology

The topic 'Fit between task and technology' describes the fit between the system that is needed to accomplish a given task and the tasks and working procedures that have to be completed by the user and that are supported by the system. We discuss the results per measurement moment (T₁, T₃, T₅).

T1: At the beginning of the field test, all participants were invited by the physiotherapist to look at the system together. This included setting up and handing over the pre-installed laptop and camera. The physiotherapist set up a common training program on the one hand and an individual training program on the other hand. On average, the participants trained for about 15 minutes at home with the system. However, they needed the support of the physiotherapist, as it was not yet clear to them how to use SALSA Health independently.

T3: The exercises in themselves represented an extensive range. Many exercises were used, which the participants also trained in their courses on site. However, it was criticized (as already mentioned) that only one side of the body is trained. This was very irritating for the physiotherapist but especially for the patients. In addition, the participants told the physiotherapist that the calibration at the beginning of the exercise was very tedious. This would decrease the motivation enormously.

T5: As mentioned in the chapter before, the field test stopped slightly earlier due to the accident of the physiotherapist. However, this had only a minor impact on the results, as nothing has changed in the therapist's opinion since T₃.

Fit between Technology and Individual

This category describes comments related to the fit between the system that is needed to accomplish a given task and the individual user or user group (patients or therapists) of that system.

T1: The participating physical therapist was able to quickly become familiar with the system. Due to the fact that she understands some English, she was able to quickly familiarize herself with the system. Even though she had sound digital skills despite her age, some steps were not immediately comprehensible and intuitive. Here, it was desired to better describe/explain the buttons or to store a help guide.

T3: The physical therapist had few problems using the system. However, the steps that were already less intuitive for her at the beginning continued to be difficult to follow. This is where she turned to the terzStiftung study director more often. Trainers who had less digital literacy would not be able to use the system. Here it would need repeated trainings.

T5: The statements are similar to those at T₁ and T₃. On the one hand, the system must become more user-friendly and intuitive, and on the other, it must be available in the local language.

5.3.2.3 Usability / User Experience

T₁: The physiotherapist liked that SALSA Health was already very well developed as an AAL project and seemed applicable for the field test. SALSA Health gave the impression of a well thought out and well-designed system. The physiotherapist was able to log in without any problems and quickly found her way around the settings after some assistance. When trying out the first exercises, the only criticism was that the laptop screen might be a little too small.

We listed these usability problems here below in Table 28.

Table 28 Usability problems (T₁)

ID	Usability problem	Solution	Available at mid-term software update (T ₃)?
1	The list of exercises is not sorted. This makes the selection extremely tedious.	Predefined categories	A filter function has been integrated.
2	During exercise sequence with different exercises the system crashes		
3	The function to see the video photo of the patients from home is very hard to find.	make this function more prominent	
4	In general, it takes some practice to be able to operate the system competently.		

T₃:

Table 29 Usability problems (T₃)

ID	Usability problem	Solution
1	Give more explanations behind the functions (give more hints), e.g. click on the program for the patient	
2	Explain with a little info-star what "home account" is.	
3	It should be easier to select exercises	
4	Too much calibration is needed before you can start playing the games	
5	It would be nice if, as a user, you can move more freely in the space while playing the exergames.	
6	The user has to keep still on the exactly same spot in order for the system to register the movements. He or she cannot go a little to the front or back.	

T5: Since the patients stopped using the system after about half of the test time, the physiotherapist also saw no reason to do so. The motivation was no longer there. Thus, no new feedback on user-friendliness can be given here.

5.3.2.4 Willingness to pay

The physiotherapist found it difficult to say something about willingness to pay. Currently, she would not pay for it. Later, when it is fully developed, she could imagine it being adopted by the field for 50 to 100 CHF per month. One could offer additional packages (like additional exercises or rubrics, which would be an extra 20 CHF each).

5.3.3 Results – patients

5.3.3.1 Motivation

This category describes the reasons that participants give for signing up to the study in the first place (at T₁), as well as their motivation to continue participation over the course of the study (T₂-T₅).

T₁: First and foremost, the patients participated in the study because they have a very close and good contact with the physiotherapist and she invited them very kindly. The work of persuasion here was clearly done by the therapist.

In addition, other arguments, some of them perhaps classical, were mentioned. These included: learning new things, getting to know new techniques, increasing fitness, maintaining one's own health, and being open to new developments.

T₂: At T₂, participants were asked if their expectations of the research had been met thus far. Participants responded in unison that it was very tedious in parts because the system did not work properly. In this respect, their expectations were not met. In addition, they stated that some new things had to be learned in order to understand it.

Up to this point, however, it would still be fun. They mentioned that it would be nice if there were more exercises. One participant expressed disappointment by saying, "*I thought the system was more advanced.*" Another participant expressed a similar sentiment, saying "*I thought it would be easier to use.*"

T₃-T₅: From time T₃ onward, they participated in the study more dutifully than on their own motivation. They used the system very little and not at all until T₅.

5.3.3.2 Values

T₁: The values mentioned in the interviews refer on the one hand to their own health and on the other hand to the system. With regard to their own health, the participants stated on the one hand that they would like to remain independent. In addition, they listed the importance of their own privacy, security and control, and trust.

On the part of the system, they expect it to function smoothly and not cause stress.

T₂ – T₅: No change in values compared to T₁.

5.3.3.3 Quality of life

Each patient filled out the Positive Health scale at T₁, T₃ and T₅. We made a radar chart of the average scores per health dimension (physical, mental, spiritual, quality of life, social, daily functioning) for each measurement moment. Figure 4 shows the three radar charts. The distribution shows that there were no differences in the response patterns to the six dimensions over time, so the intervention was most likely unrelated to the subjective QoL.

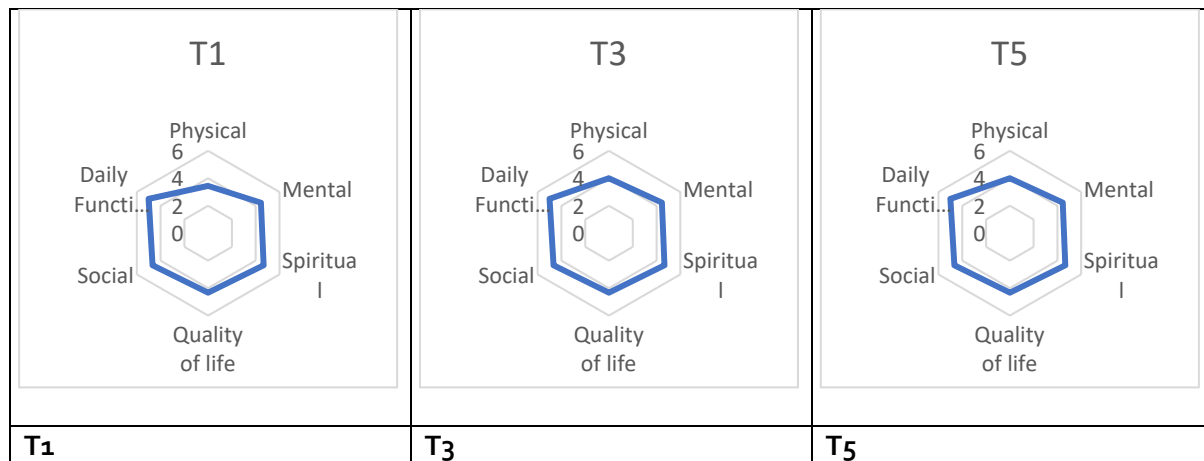


Figure 4 Average scores of positive health per measurement moment (T1, T3, T5)

5.3.3.4 EQ-5D-5L

The data shows that fluctuations of the health and daily scores across the different measurement points were only minor. A maximum recorded change between T1 and T5 was 10 points. The range of scores across the different test persons spanned no bigger than 20 points (at T5, whilst the ranges at T1 and T3 were 10 and 15 points, respectively).

Table 30 EQ-5D-5L

Participant	T1		T3		T5	
	Health score	Daily score	Health score	Daily score	Health score	Daily score
1	21121	80	21121	85	21121	80
2	21131	75	21131	70	21131	65
3	31121	80	31121	75	31121	80
4	21131	85	21131	80	21131	85
5	21121	75	21121	75	21121	85
Average		79		77		79
Min		75		70		65
Max		85		85		85

5.3.3.5 Usability / User Experience

5.3.3.5.1 Usability benchmarks

As already explained in chapter 5.1.3.7.1, two scales were used to measure usability: SUS and HUBBI. For SALSA Health, the average SUS score of T3 and T5 was 50.5, which means that usability was rated as unacceptable.

The following figures shows the distribution of the individual answers of T3 and T5:

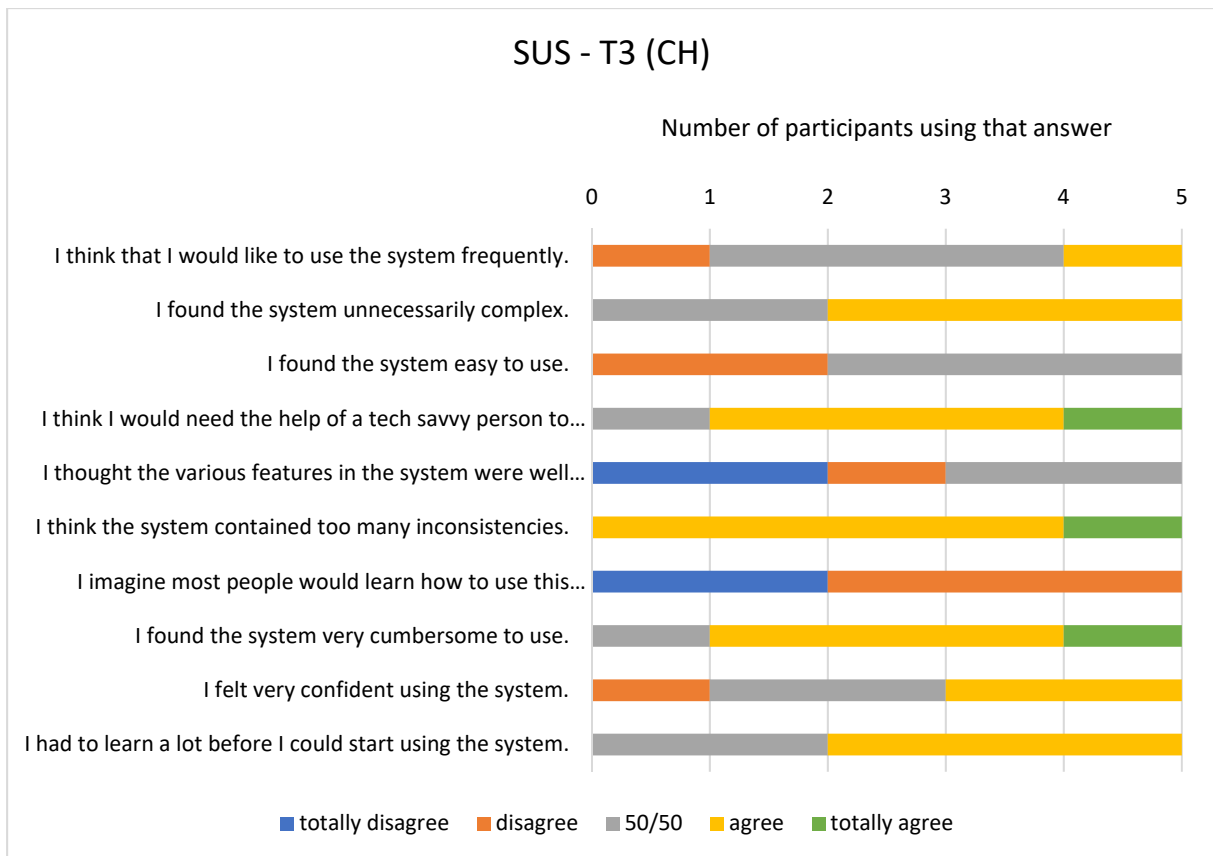


Figure 5 SUS scores T3

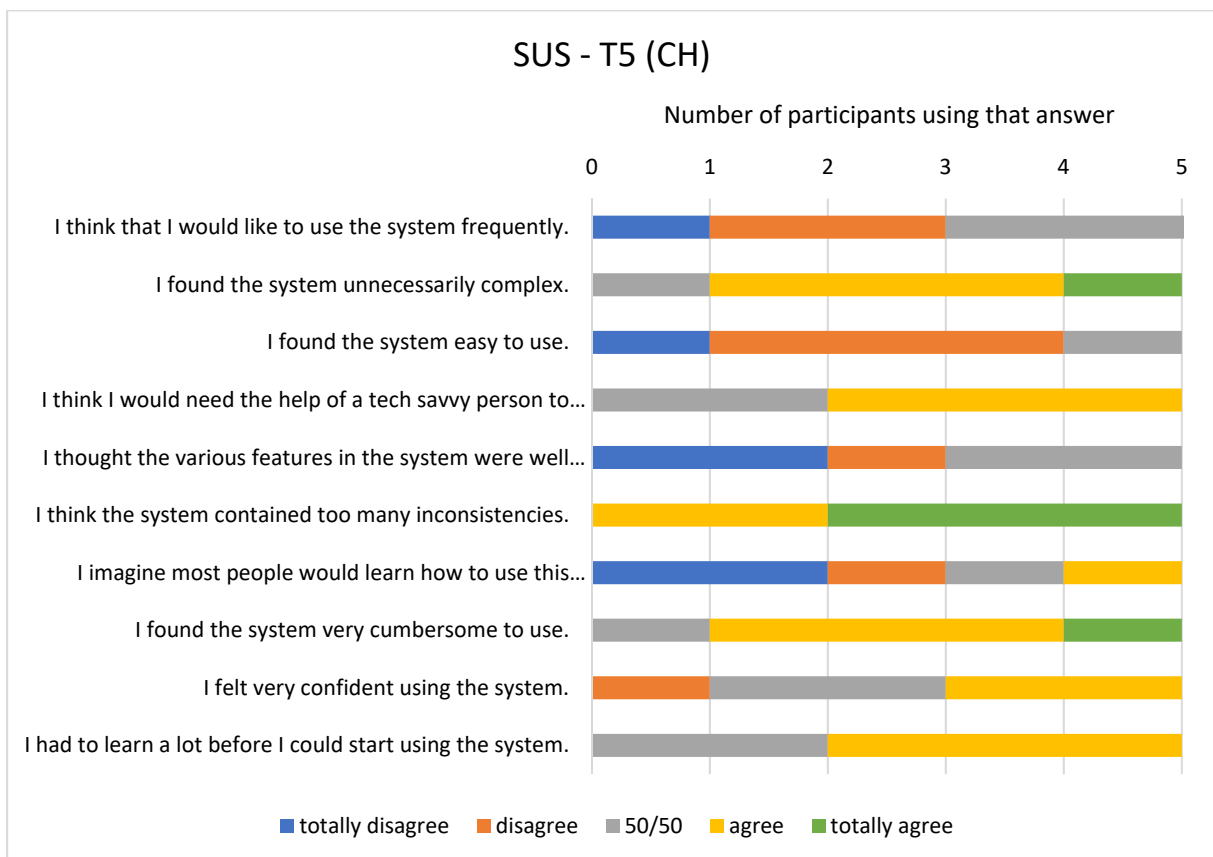


Figure 6 SUS scores T5

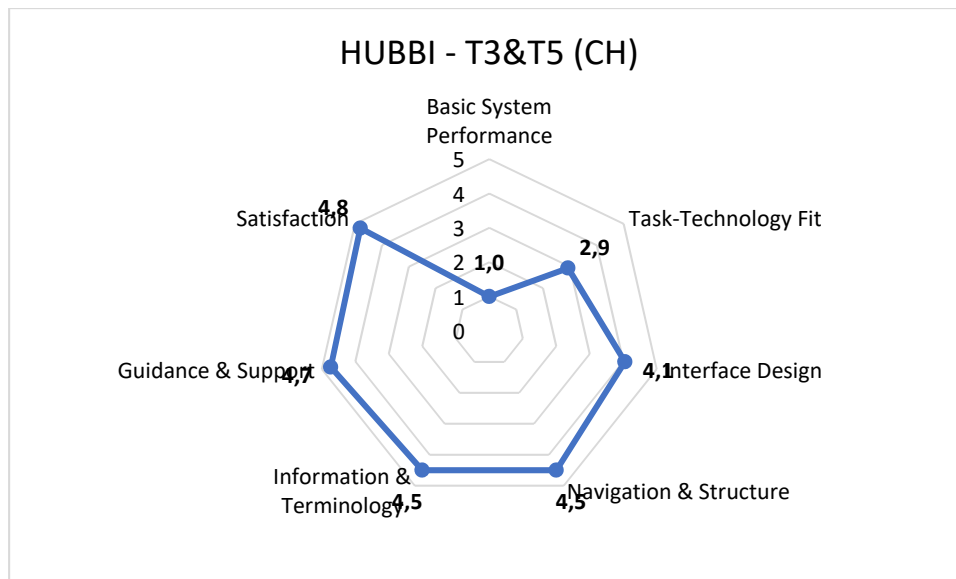


Figure 7 HUBBI scores T₃ & T₅

5.3.3.5.2 User experience

User experience with SALSA Health was measured with the Exergame Enjoyment Questionnaire (EEQ) (Fitzgerald et al., 2020). This is a 20-item survey that measures how well participants like playing exergames. It provides a score between 20 (very low) to 100 (very high). This questionnaire was asked at T₃ and T₅.

The average score for the 5 Swiss participants was 55.2 which is below the median of the possible scores and indicates low satisfaction with user experience.

5.3.3.5.3 Qualitative remarks on usability per measurement moment

T₁: As the system was only introduced and tried out together in the first session, no feedback on usability was given yet. However, there was one participant who had difficulties logging in with her already created access data. In the end, the problem was quickly solved. The cause was the different habits of the Windows and Apple operating systems.

T₂: After six weeks of use, the participants gave their first feedback on usability. In general, the negative experiences already predominated. The participants were most frustrated by the lack of functionality. In their opinion, the system was not developed enough. The initial euphoria had faded. One participant expressed his frustration by saying that the system should be better checked beforehand. They all shared the opinion that the system only supported their treatment to a limited extent, as it was still under development. *"In the future, it could certainly bring something. Currently it doesn't."*

T₃: During the T₃ interviews, the initial excitement and the associated uncertainty about the system had subsided somewhat. The participants now use the system as well as they can. One participant still thought the idea was good, but there was still a lot to be done in the implementation.

Another participant mentioned that she liked the idea, *"but I would like the games to fit better with the exercises. Sometimes I do the exercise correctly, but the system doesn't recognise it."*

In contrast, a third participant mentioned that the system would praise her even though she did poorly. This was not motivating.

T₄: There were no additional comments

T5: Since the participants did not complete the field test due to what they considered to be still too many weaknesses in the system, no new insights could be gained in the final interview.

5.3.3.6 Willingness to pay

Of the 5 participants, 4 stated that they would not currently spend money on SALSA Health. Only one person gave a positive response. If it would cost money and if the system works smoothly, the participants could imagine spending between 10 and 20 Swiss francs on it.

6 Conclusions SALSA Health

6.1 Netherlands

While participants were enthusiastic about the use of SALSA Health in their treatment at first, this interest decreased over the course of the study. Both for the therapists and the patients, some usability issues became apparent the more they used SALSA Health, which made them less likely to use the system. However, patients and therapists alike saw potential in the use of SALSA Health at home, to support self-management of the patients and keep them active outside of the therapy. Yet, only one participant was willing to pay for SALSA Health.

6.2 Switzerland

High motivation in trying new solutions and integrating exergames into training routines was compromised by low system performance, mainly relating to usability issues, arrangement of exercises and long-term motivational incentives. Overall, the time invested into using the system was not worth the values suggested by the system, even though contents were in principle rated favourably. Some of these insights can be explained by the arrangement of the field tests given the present technology readiness level (TRL): Testing in the field meant that users had expectations towards their real problem statements which the system was not fully able to satisfy under prototype conditions. Major challenges related to difficulties in setting the system up and the fact that certain arrangement were still in prototype quality (e.g. not everything translated, fewer attention to supporting instructions) which can be an important hindrance to overall satisfaction for people who are not familiar with stages of product development. That said, attention should be put to making the system more intuitive, self-explaining and free of inconsistencies when bringing the prototype to a market-ready level.

6.3 Austria

The study showed some signs of health improvements for users of the SALSA Health app. Nevertheless, as usability, user experience and satisfaction was noticeably lower than comparable interventions in the medical or therapeutic field (assessment based on the experience of the evaluating statistician), and as every user complained about technical problems, software bugs or other technical problems, further improvements on the app should be executed. The physiotherapist classified SALSA Health as suitable for larger rehabilitation centers in which more emphasis is placed on prophylaxis and group therapies are offered. In her opinion the system is particularly suitable for promoting health and strengthening the musculoskeletal system. The physiotherapist would not use SALSA Health in the therapy of patients with clinical (painful) symptoms because the movements were too unspecific.

Part B: Real-life evaluation results of SALSA Fun

7 Introduction and use cases

7.1 Objectives

Aim of the pilot is to evaluate impact of the use of the SALSA platform on the different types of end-users. SALSA is evaluated on quality of life of the older participants as well on loyalty and alliance to the tool of the several stakeholders. Evaluating the usability and user experience of the platform developed with older end-users and trainers. In the pilot, we elaborate on the usability and acceptability of the platform, the way it is integrated within the other services provided and the roles of the different involved users (e.g. older adults also described as senior participants and trainers). As a result, we aim to improve the sport activities for the older adults, at different levels. We therefore include the following objectives:

Main objective of the real-life evaluation is to investigate the perceived added value of the SALSA Fun platform for trainers who focus on organizing group activities aimed at seniors participants. We define this value as: higher workflow efficiency and better quality of trainings that are specifically aimed at seniors.

The secondary objective is to investigate how SALSA Fun indirectly contributes to the quality of life and adaption of a healthy lifestyle of senior participants. SALSA Fun aims to have an indirect effect on the quality of life of senior participants, as it is known that through supporting local sport group activities that are senior friendly, seniors maintain a regular physical routine, increase motivation and enjoyment of sports, and obtain a higher quality of life. Studies show that programming must be varied, fun and social [Costello, Kafchinski, Vrazel, 2011] and that if participants feel a sense of belonging with other people, they are more likely to stick with exercising [Beachamp, Ruissen, Dunlop, 2018]. The SALSA Fun platform allows trainers and senior participants to optimize the (local) sport group activities and may therefore also optimize the results in terms of health and quality of life among the participants.

7.2 Pilot sites

7.2.1 The Netherlands: Oldstars

In the Netherlands SALSA Fun will be used in the real-life context of OldStars Sports, a national program of NFE offering adjusted sports since 2014 and is currently run at 424 sport clubs in the Netherlands.

The starting point of OldStars is the positive contribution of club life to the quality of life of older people. The game variants give senior citizens the opportunity to continue to participate at their own level in and around the sports club. In this way they experience the benefits of lifelong sport, an important goal of the National Elderly Fund and partner Menzis. All forms of movement adapted by the National Elderly Fund are introduced by OldStars' movement strategist René Wormhoudt to clubs, game supervisors and players with the Athletic Skills Model (ASM). This model serves as the basis for all of OldStars' modified forms of play.

For this real-life evaluation, OldStars clubs and trainers were invited to join the SALSA Field Trial.

7.2.2 Austria: Walking sports

Inspired by the approved Oldstars Walking Sports concept from the Netherlands, the Austrian partner YOU launched the Walking Sports concept in Austria. YOU used SALSA Fun to establish the first Austrian Walking Sports platform and groups starting with Walking Football. YOU organized regional demo days and train the trainer events to promote the walking sport idea to clubs, trainers, health experts and the media. First trainings and even a small tournament were planned in fall 2020.

7.2.3 Switzerland: Stand-up peddle and Qigong

The Swiss trials integrated SALSA Fun into three training group concepts that have been established in parallel with the technology developments in the SALSA project. SALSA Fun was meant to increase the visibility of the groups, allow coaches and participants to share thoughts and activities and to organise activities both for official training and private sessions.

In Stand Up Paddling you move forward standing with a long paddle. SUP, the abbreviation for Stand Up Paddling, can be practiced on different waters (lake, sea, river). Stand-up paddling (SUP) is the fastest growing water sport with impulses for physical and mental fitness, social and environmental aspects. terzStiftung set up specific training module for older adults in cooperation with instructors from the Swiss Canoeing Associations.

The Salsa Fun platform supports the organization of the courses for the SUP courses in Berlingen, Switzerland for participants who are 55 years or older. Interested participants book SUP course via SALSA platform. Participants who show interest in the new sport can inform themselves about SUP on this platform and contact the trainers for more information. The possible course units and course times for which the participants can register are shown on the SALSA Fun platform. The booked courses are shown to the respective user on his personal start page. The aim is to motivate the participants to take part in regular sports units and to get to know new popular sports. The trigger to turn to the SALSA platform lies in the curiosity to get to know the new sport, to learn it and to practice it in the long term. As soon as they are interested in SUP and have found the courses on the SALSA platform, they can get more information about SUP on the platform. Once they have decided to participate in the courses, they choose the dates that suit them and register.

A second course programme that was boarded on to the SALSA Fun platform was a Qigong group, parts of which had existed prior to the SALSA project. SALSA fun was intended to increase the reach of the group and multiply occasions for formal and informal practicing.

Qigong is a Chinese form of meditation, concentration and movement for the cultivation of body and mind. It also includes martial arts exercises. The practice includes breathing exercises, physical and movement exercises, concentration exercises and meditation exercises. The exercises are intended to harmonize and regulate the flow of qi in the body.

The targeted participants are 55 years or older and enjoy trying new things. The participants do not need to have any special previous knowledge.

The trigger to turn to the SALSA Fun platform is the curiosity to learn about the new sport, to learn it and to practice it in the long term. Once they are interested in Qigong in old age and find the courses on the SALSA Fun platform, they can get more information about Qigong on the platform. Once they have decided to participate in the courses, they choose the dates that suit them and register.

A third group that was supposed to benefit from the SALSA Fun channel was a seniors' gymnastics group supervised by professional physiotherapists.

8 Methods

8.1 Study design

An observational longitudinal study for 12 weeks with repeated measurements and a mixed methods approach was carried out following the evaluation protocol described in deliverable 4.2. During this study a cohort of both trainers and senior participants was followed for a period of 12 weeks while using SALSA Fun during their regular participation in the (sport) community. In total there were three measuring moments, T1 (pre-test), T2 (mid-term) and T3 (post-test). Senior participants were asked to complete questionnaires and to perform a physical test at T1 and T3. Next to this they are invited for focus group sessions at T2 and T3. The trainers completed a questionnaire at T1, T2 and T3 and were asked to participate in a focus group on T2 and T3.

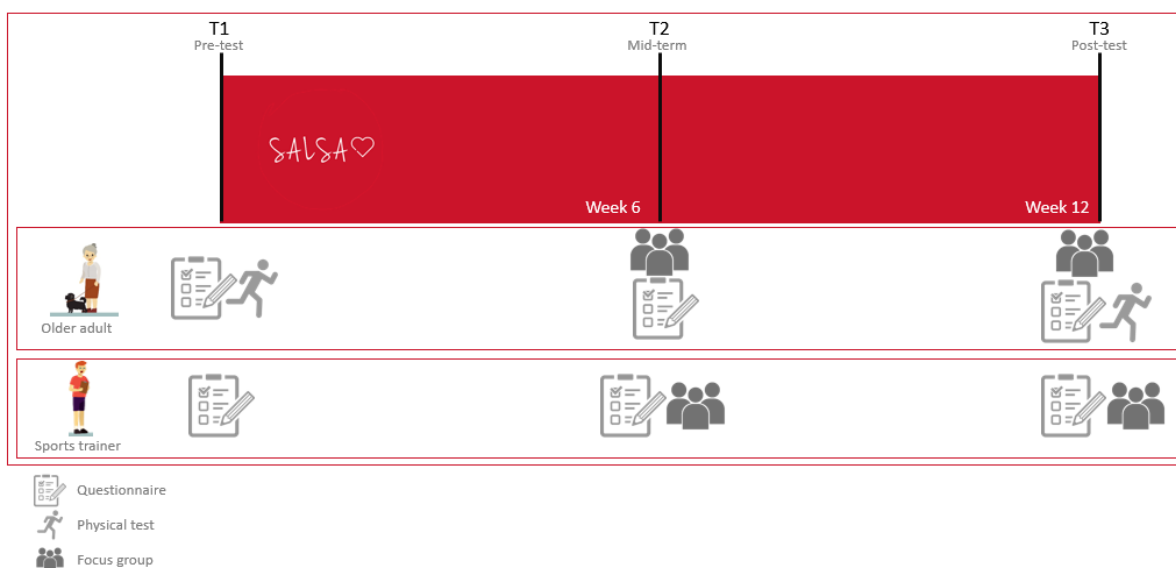


Figure 8 Overview study SALSA Fun evaluation

8.1.1 Changes in study design: Netherlands

We started the pilot by organizing two kick-off moments for trainers in which we demonstrated the platform and explained the study design. For the trainers there were no deviations from the study design.

At T1 for the older adults, we also took some more time to demonstrate the platform. T1 and T2 were organized according to plan. Based on the outcomes of the first focus groups for senior participants, we decided to skip the T3 focus group. Participants were not motivated to use the platform and provided already good feedback during T2. However, we did not expect to gain new insights by organizing another focus group at T3. Instead we did send the questionnaires as planned. We performed the physical test of T3 at one team of senior participants. Due to COVID measurements we were not able to perform the physical tests at the other two teams.

At one focus group with senior participants, some participants asked whether it was possible for them as well to see the exercise videos because they were sometimes asked to take over a training. To explore this new target group, we organized an additional focus group with three substitute trainers. We gave them access to the trainers part of the platform to see if this could be useful for them as well.

8.1.2 Changes in study design: Austria

At the official pilot start in June 2021, researchers participated in the training, explained the pilot setup, handed out information sheets, demonstrated the SALSA Fun platform and did the first 6MW tests. As the participant number was rather low, it was decided, that researchers are present continuously at the following trainings to recruit more pilot participants, do the tests and help them in case of questions and technical problems. The T1 questionnaires were sent out online using survey monkey.

There was a continuous coming and going of participants, so at pilot half-time there were hardly any participants left from the beginning, so T2 was skipped. Feedback was continuously gathered during the trainings, but showed that the participants were reluctant to use the platform despite repeated motivations and reminders. At T3 only one of the initial participants was left, so the original measurement instruments were replaced by a short final questionnaire, which was sent out to all participants, who had signed the informed consent.

As the two trainers had repeatedly been involved in the pre-test evaluations, they were already very familiar with the SALSA Fun platform and did not need any further introduction or training. The T1 questionnaires were sent out as planned. As described above, researchers were in constant contact with the trainers, usability issues and feedback were gathered repeatedly at the trainings and by phone calls, therefore the more formal focus group at T2 was skipped. At T3 the questionnaires were sent out and the focus group replaced by an adapted interview that followed the structure of the focus group planning.

8.1.3 Changes in study design: Switzerland

A dedicated observational study could not be performed given the unattractiveness of the platform in the field trial. Despite a dedicated onboarding campaign that was meant to direct users to the platform, there were no subscriptions to SALSA Fun. terzStiftung therefore issued a general survey with 91 participants to find insights into the low acceptance in the field.

8.2 Measurement instruments

Table 31 en Table 32 provide an overview of the measurement instruments used for SALSA Fun.

Table 31 Overview measurement instruments for senior participants

		Wk 0	Wk 6	Wk 12
		T1	T2	T3
Usability issues	focus group		X *	X*
Demographics	questionnaire	X		
SUS	questionnaire		X *	X*
TAM	focus group		X *	X*
6mwt	test / questionnaire	X	X	x
EQ-5D-5L	questionnaire	X	X	x
Willingness to pay	questionnaire			X*
Quality of life	Focus group			x

Table 32 Overview measurement instruments for trainers

		Wk 0	Wk 6	Wk 12
		T1	T2	T3
Demographics	questionnaire	X		
SUS	questionnaire		x	x
TAM	focus group		x	x

Willingness to pay	questionnaire			x
Usability issues	focus group		x	x
Task-technology fit	focus group		x	x
Workflow	focus group		x	x
NGSES	Questionnaire + focus group	X		x

8.3 Participants and recruitment

8.3.1 Netherlands

From all Dutch Oldstars clubs, several trainers were approached to participate in the SALSA Fun Field Trial. Among this group were trainers who were already involved in the beginning of the project and assisted in providing feedback on the general concept of SALSA Fun. In the final selection, we included trainers from various sports.

After the selection of the trainers for this study, we asked three Oldstars teams from those participating trainers to participate in the Field Trial as 'older adult'. Again we selected teams from different sports in order to be able to compare if there are different preferences in different sports.

8.3.2 Austria

Recruiting began early in 2020, right after the field trip of Austrian project partners from YOU and LFTL to the Netherlands in February. The field trip aimed to give the Austrian partners a first-hand experience of the Walking Sports movement by visiting four different Walking Sports clubs in the Netherlands, participating in the trainings and talking with participants and trainers. The experience was very convincing, the motivation very high to establish similar activities in Austria.

In May 2020, after the first lockdown, the project partner YOU started to promote Walking Sports in Austria. Meetings were held with the most important Austrian umbrella sport organisations Union, ÖTB, ASKÖ, Naturfreunde, also with the „Gesunde Gemeinde“ Initiative and the „Gesunde Gemeinde“ Health Network.

In addition to the project webpage the first Austrian website for Walking Sports was published www.walkingsports.online, a trainer manual was created and also promotion material for village and community engagement.

The screenshot shows the website for 'Walking Sports Austria'. The header includes the logo, the slogan "DU GEHST NIE ALLEINE!", and navigation links: Start, Events in OÖ, Info, Videos, and More. Below the header is a video gallery section titled "Alle Videos" with a dropdown for "Kategorien". Three video thumbnails are displayed:

- Varianten Reichtum im Training**: In diesem Video wird ein kurzer Einblick in den Variantenreichtum des Walking Sports Trainings gewährt.
- Trainings Impressionen**: In diesem Video wird ein kurzer Einblick in ein Walking Sports Training gewährt.
- Spiel Impressionen**: In diesem Video wird ein ganz kurzer Einblick in ein Walking Football Liga Spiel in den Niederlanden gewährt.

In summer/fall the first walking sports events were held in Bad Schallerbach, with a total of 20 participants and 5 trainers. The feedback was great, but the events could not be continued and a scheduled small tournament could not take place, as the Corona measures were tightened again in September 2020.



It was not before summer 21, that it was possible to continue with the walking sports activities. These activities should not only prepare the real pilot activity, but also lay the basis for further recruitment and attract interested clubs and trainers to start more walking sports groups. Unluckily and despite further promotion activities in local newspapers and social media we were far from reaching the numbers of participants from fall 2020. Even though the participants from the past Walking Sports events were contacted and invited personally to join the sports activities again, numbers stayed low.

We do not know the exact reasons for this poor participation rate. A survey among 2000 participants regarding sport activities in times of the Corona pandemic indicates, that physical activities have generally and especially declined among elderly due to lockdown and safety measures⁶.

8.3.3 Switzerland

SALSA Fun was supposed to be integrated into the three training groups SUP50+, Qigong im Alter and the seniors' gymnastics course "BlibFit" and support these groups by giving them a platform for additional exchange, coordination and insights into the sports. The sports groups had been set up through different campaigns in 2020 and were active up to the study period, however, with low interest into the values suggested by SALSA Fun. terzStiftung ran a media campaign ("Fit für den Sommer") comprising 4 newspaper articles, more than 20 facebook posts + paid facebook ads, leaflets and 8 newsletters to onboard users to the course, supported by a production of 21 training videos to tie candidates to online sources (dedicated course websites) where SALSA Fun was integrated as the community building tool (to be retrieved via fit.terzstiftung.ch; also consult WP5 documents). Whereas response to the campaign was very favorable (e.g. 95 subscriptions to the campaign newsletter), no single candidate registered for SALSA Fun within the 2 month campaign phase. There was thus no possibility in evaluating user experience and so terzStiftung issued a general survey on the use of sports platforms instead to find reasons for the low engagement of users (see section 9.3.1).

⁶ Der Lockdown verändert das Sportverhalten massiv: <https://bit.ly/3DPsS58>

9 Results

9.1 The Netherlands

9.1.1 Participants / demographics

Trainers

In total 13 trainers from various walking sports participated in this study. Most trainers were males, only W19 was female. Three trainers were between 30-40 years old, one trainer between 40-50 years old, two trainers between 50-60 years old, four trainers between 60-70 years and three trainers between 70-80 years old. Most trainers were married, one trainer was in a domestic relationship, one trainer was single and one trainer got divorced. At the start of the study, five trainers were retired, four trainers were working full time, three were self-employed and one trainer indicated to be unemployed (not currently looking for work).

Table 33 Demographic data trainers

ID	Age	Gender	Educational level	Marital status	Current employment status
Q21	30-40 years	Male	Post-secondary vocational education	Maried	Self-employed
R22	40-50 year	Male	Academic education	Maried	Employed full-time
T24	70-80 year	Male	Higher vocational education / Bachelor's degree	Maried	Retired
U25	30-40 year	Male	Higher vocational education	Single	Employed full-time
V20	60-70 year	Male	Higher vocational education	Maried	Self-employed
V26	60-70 year	Male	Post-secondary vocational education	Maried	Retired
W19	50-60 year	Female	Post-secondary vocational education	Maried	Unemployed (not currently looking for work)
W27	70-80 year	Male	High school degree or equivalent	Maried	Retired
X18	50-60 year	Male	Higher vocational education	Divorced	Employed full-time
X28	60-70 year	Male	Higher vocational education	Maried	Self-employed
Y29	30-40 year	Male	Higher vocational education	In a domestic relationship	Employed full-time
Z16	70-80 year	Male	Post-secondary vocational education	Maried	Retired
Z30	60-70 year	Male	Post-secondary vocational education	Maried	Retired

Table 34 Demographic data trainers

ID	Role in Oldstars	Type of walking sport	Number of years involved as trainer in general?	Number of years involved as 'walking sport' trainer?
Q21	Trainer	Tennis	9	1
R22	Trainer	Walking Basketball	25	1
T24	Trainer	Walking Football	2	2
U25	Trainer	Running	15	2
V20	Trainer	Walking Rugby	20	2
V26	Trainer	Walking Handball		
W19	Co-trainer & participant	Walking Hockey		
W27	Trainer	Walking Football	3	3
X18	Ambassador	Walking Rugby		
X28	Trainer	Walking Rugby	47	3
Y29	Trainer	Walking Handball	3	3
Z16	Project employee & OldStars trainer	Walking Football / Walking Handball / Walking Korfbal / OldStars volleyball		
Z30	Trainer	Walking Football		

Senior participants

Participants of three Oldstars teams joined the study. In total 32 older adults referred to as senior participants participated in the study: 11 walking football, 11 walking handball and 10 walking hockey. They joined the walking sports community between 0,5 and 5 years. On average they had 2 years of Oldstars experience. Half of the participants were aged between 60-70 years old, the other half was 70 years of older. Only one participant was over 80 years old. Twenty two males participated versus ten females.

All participants lived independently, mostly with their partner which they are married with. Only 4 participants lived alone of which two were widow and two participants were single. Twenty five participants were retired, three did not have job and were not looking for one, two participants worked part time, one worked full time and one indicated to be a volunteer. A summary table of the senior participants demographics can be found in Appendix 1 – Demographic data senior participants SALSA Fun - NL.

In the results sections below, we only included the quantitative data of participants who filled in all questionnaires of one measurement moment. Table 35 shows the number of included participants in each measurement moment. We started with 32 participants who filled in all T1 questionnaires. Twelve participants did not complete all T2 questionnaires, therefore we ended with 20 participants in T2. Another 5 participants did not complete the T3 questionnaires, leaving us with 15 participants who completed all measurement moments. This drop-out might be explained by the fact that participants were not really motivated to further test the platform and fill in the questionnaires because they did not clearly see the (potential) added value of the platform for their situation.

Table 35 Drop out numbers after each measurement moment

Measurement moment	# respondents who filled in all questionnaires of the measurement moment	# respondents who filled in some questionnaires of a measurement moment	# only respondents who filled in all questionnaires from the start
T1	32	1	32
T2	21	2	20
T3	18	5	15

9.1.2 Use

9.1.2.1 Actual use

Trainers:

Trainers used various devices. In the focus groups of T2 we got the feedback that trainers experienced difficulties in transferring the videos from their phone to their computer in order to upload them on the platform. Therefore we actively stimulated them to test whether this process would be easier by using the SALSA Fun app. Some trainers tried the app. Others explained that although they created the exercise videos on their phone, they preferred to upload it via their computer.

Actual use of the platform by trainers:

- *Teams & activities*: nine teams were created with in total 14 activities.
- *Exercise & training*: nine trainers put between 1 and 8 exercise videos on the platform. In total, 31 videos were uploaded. No training forms were created.
- *Forum*: only one trainer placed a message in the forum.

Senior participants:

Although we organized a kick-off at each pilot site where we demonstrated all functionalities of the platform and explained the research, we noticed that senior participants still did not know why they should use the platform. This resulted in the fact that senior participants primarily used the platform when we approached them for a new measurement moment. During the focus group some participants mentioned that they did not use the platform at all, because they forgot that this was needed or did not feel the urge to do so.

In addition, many participants mentioned the lack of information that was currently on the platform. Even though we explained that this was a test environment containing only limited information, we noticed that due to this lack of information participants were not motivated to continue exploring the platform. Another reason for this lack of motivations was that they could not find their team on the platform. This was the case because of some starting issues at their trainers side. Two trainers experienced difficulties at the beginning and therefore were not able to create their team from the start. The older adults from these teams however started using the platform searching for their own team. Once they could not find this, they were quickly de-motivated in using it:

"I finally managed to search for 'Leiderdorp', but then it said 'no results found'. But I thought: 'I do really play hockey in this city'" (participant)

For each measurement moment we provided the direct link to the platform in the e-mail invitation. However, when many participants searched for the platform on Google by using search terms related to 'Salsa' they could not easily find it. In addition, this term did not match their expectation: being an Oldstar walking sports player.

Most senior participants used a computer or laptop to go to the platform.

9.1.2.2 Perceived usefulness

Trainers

Trainers commended on the perceived usefulness and added value of various features on the platform.

The feature that was mentioned the most was the **exercise videos as a source for inspiration**. Trainers got inspired by the exercise videos of other trainers. They explained that it is important to keep their trainings interesting for the participants. This can be done by alternating exercises and preventing repetition. Therefore, the platform provides good inspiration specific for their older participants. It also enhances creativity by learning of and combining exercises of different sports. One trainer said:

"It's about creativity. With that you can do fun things. Badminton with blowing bubbles, how am I going to use that, and how do I translate that to basketball? Simultaneously holding the basketball while also working on a badminton racket."

Moreover, one trainer was also interested to see how other trainers would use a type of training equipment in exercises for their sports.

Other more experienced trainers felt the need and responsibility for sharing their exercises as an inspiration to other (new) trainers. Thereby they want to share their knowledge about exercising for elderly. In addition sharing their favourite exercises, they also stressed the importance of sharing knowledge about what does not work for this target group.

This source of inspiration only counted for the exercise feature. The possibility to upload **training forms** was not seen as valuable for the participating trainers. They explained that as long as the goals of an exercise are clearly described at the exercise video description, a training form of a whole training would not be useful for them. Furthermore they explained that they all have their own way of preparing a training and while standing on the field, they do not carry a print of a training. However, they noted that this functionality might be useful for new trainers who are less experienced or for students or substitute trainers who take over in case a trainer is absent:

"And if you do that for a while then you don't carry papers that say all that. You've made that your own. But it might be good for people who are new, who are making training preparations, to find someone for that who can analyse those videos and make a training form out of that."

"So I do have the necessary experience in training construction, but potential new trainers who don't have that experience would benefit from that to start responsibly especially with this target group, especially the warm-up."

"Then you can write a training course so that, if you're not there, someone else can just take over."

In the additional focus group with substitute trainers we asked about their preferences in assistance in training preparation. They mentioned that a basic set up of training would be useful. However, this should not become too detailed.

The feature to **register participants** to an activity was valued by two trainers. These were professional trainers who trained many different teams. One platform providing the overview of participants who registered for a training would be valuable compared to checking all reactions in different Whats-app groups. In order to stimulate participants to view the platform, this trainer suggested to post photos of the training on the platform at the activity. One other trainer did not perceive this feature as useful

for himself because he only stayed at one club for a short period to get them started. He however mentioned that this might be an interesting feature for the club itself.

The forum was rated as less interesting for the trainers. Although some trainers mentioned that it could potentially be interesting to discuss with others about various topics, in reality we saw that only one trainer reacted on the posts on the forum. Most trainers said that it simply did not have their priority:

"I had seen that the forum was on there, but I didn't have the immediate inspiration to do anything with it. I also didn't really know what the purpose of that was."

As an alternative one trainer mentioned that it would be more interesting to put a comment on an exercise video and get interaction via that feature instead of a forum. Another alternative for sharing interesting content about sport and exercise could be to create a 'news' page. This page could include articles about the usefulness of moving for elderly or interesting seminars. Other trainers liked this idea as well.

Senior participants

As mentioned before, the information that is currently available on the platform for senior participants is limited. Therefore it was difficult for participants to say something about the perceived usefulness. They expected to find more **information about their club and team**: address of club, members of team, contact person. The current platform includes fields to provide all this information. In addition, information and contact details of other clubs who have Oldstar teams was mentioned for example to organize tournaments. This feature is currently already available on the Oldstars website as well. However, one participant mentioned that this still took quite some steps to gain this information.

Although two trainers found the **registration functionality** of the platform useful to monitor attendance of a training or event, most senior participants preferred Whats-app for this purpose.

"You are in several WhatsApp groups and you automatically look in them. So if I look there, I grab the Medemblik WhatsApp group as well. And otherwise you really have to go to the app of SALSA, which you do less quickly. You're so spoiled as a human being with WhatsApp. I think it's more likely to stay that way."

Some senior participants understand the usefulness of the platform for this from their trainer's perspective, but they think that it would be hard for trainers to convince participants to use the platform instead of Whats-app.

In addition, participants of one team that participated in this field trial do not have to register at all for joining regular trainings. For them, it would only be useful to register for special trainings. For example if there is a guest trainer. In that case you want to know that there will be enough participants so registration would be necessary. One person suggested to share a link via Whats-app to this event on the platform.

Once filled with all activities and clubs, the platform could provide an overview of the Oldstar possibilities in a neighbourhood. Thereby it would become an interesting place to search for activities. Senior participants could also use the platform to refer to interested peers.

In order to recruit new participants, a **compilation of videos of exercises** from the trainers side of the platform could be used to show what Oldstar trainings are like. Thereby they may lower the barriers for new seniors to join. This could be an interesting approach in combination with the word of mouth recruitment that is currently used.

One trainer suggested to make the exercise videos of one club also available for senior participants of that club so that they can use them to **practice at home**. We asked all senior participants whether they would like this feature, but they all responded negative. They are already happy with going to the live training once a week and do not want to practice further at home.

Substitute trainers

At one focus group with senior participants, some participants asked whether it was possible for them as well to see the exercise videos because they were sometimes asked to take over a training. They were looking for the right exercises to use for this Oldstar group, which is a different group compared to teams that they might have trained in the past.

We organized an additional focus group with three substitute trainers and gave them access to the trainers part of the platform to see if this could be useful for them as well. They explained that they were looking for the right exercises to use for this target group. The rules of play are different which affects the skills that you need to have as a player. For example, in hockey if you are not allowed to run, stick handling is even more important. Moreover, how can you unlearn some skills from the past that are not allowed in walking hockey. Lastly and most important how to keep the training attractive and fun for all players. Walking sports attract new participants who have no previous experience with a certain sport. This could be a difficult group for substitute trainers to train: how to give a proper warming up and how to provide basic skills exercises without getting boring.

9.1.2.3 Intention to use

Trainers

All trainers wanted to keep using the platform. The main reason was to get and provide inspiration for exercises and learn from each other. One trainer of an organization who was an early adopter of that walking sport, felt the responsibility to share his knowledge to other clubs and trainers via the platform. The platform should contain inspiring exercise forms to enhance creativity, variety and originality in trainings.

"On the one hand to show what we are doing for other trainers, and at the same time to see how they are doing with their sports. And if we can get some inspirations out of it, then you can enrich your trainings again."

In addition, all trainers stated that quality of the content of the platform was very important. This aspect is further elaborated on in paragraph 9.1.3.5. Two trainers still believed in the usefulness of the platform for registration to trainings by the participants.

Senior participants

In general, almost all senior participants would not intent to use the platform after the pilot. The platform did not provide any added value for them. They use Whats-app for communication with their team and if they want to find additional clubs or activities, they would use Google to find it.

However, two persons liked the possibility of the platform to refer peers to to find more information about exercising as elderly. This would only be interesting if all sport offerings in a region would be available on the platform:

"I'm sure there are plenty of people from my generation searching for sport and exercise, and then you can refer to that. That's how I see it more, so more for the others than for myself. But then the platform has to be from the testing phase because I'm not going to refer anyone to that now."

9.1.3 Usability

At the start, some older trainers experienced some difficulties in trying out a new platform. They explained that they are not used to this type of technology. In addition, one trainer found it difficult to make videos on this phone because he was not used to doing this.

In general, most senior participants and trainers found the platform easy to use. The exercise forms contain direct and concrete lines to fill, in comparison to other platforms where you have to go through many fields in order to upload your information. After logging in, they knew directly where to go to. Only one trainer noted that in the app, he could not directly see the exercise and training part. This was only visible in the menu. He suggested to place this in the home page since this is most interesting for trainers. In addition, one senior participant mentioned that he created an account but did not know what he could do with it.

When looking at the System Usability Scale (SUS) (Brooke, 1996)⁷ outcomes, this was less positive. Eleven trainers and twenty to fifteen senior participants filled out these questionnaires. The SUS provides a single score of the system's usability, ranging from 0 (very bad) to 100 (very good). For SALSA Fun, the average overall SUS score was 58 for trainers and 56 for senior participants, meaning that the usability is below average (Lewis & Sauro, 2018)⁸ and thus that the system's usability contains serious defaults.

Table 36 Outcomes System Usability Scale questionnaires

	Trainers	Senior participants
T2 (average score)	57,0	62,1 (n=20)
T3 (average score)	59,0	50,7 (n=15)
Overall	58,0	56,4

The following paragraphs summarize the usability issues that were mentioned during the focus groups.

9.1.3.1 Need for support

While getting started in using the platform, some older trainers asked help from their children or grandchildren. Others contacted the researchers of this study in the beginning to ask for some assistance. One trainer summarized it as:

"That's just a matter of sitting down and then anyone can do it, I always say."

Although, in the end most trainers managed to work with the platform they expressed the following need for support:

- Instructions on how to make a proper exercise video on your phone.
- Instructions on how to upload a video made on your phone, via your computer/laptop to the platform.
- Description of exercise video: do you need to add description about applicable ASM ground forms at goals of the exercise?

⁷ Brooke, J. (1996). SUS - A quick and dirty usability scale. In and I. L. M. (Eds. . P.W.Jordan, B. Thomas, B.A. Weerdmeester (Ed.), *Usability evaluation in industry* (pp. 189–194). Taylor & Francis

⁸ Lewis, J. R., & Sauro, J. (2018). Item Benchmarks for the System Usability Scale. *Journal of Usability Studies*, 13(3), 158–167. http://uxpajournal.org/wp-content/uploads/sites/8/pdf/JUS_Lewis_May2018.pdf

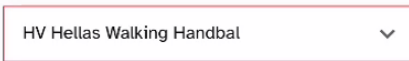
During the focus groups trainers who had experience in these topics started giving tips right away. For example, one trainer explained that you could go to the settings of your phone camera to set the landscape mode of your camera. For uploading they recommended using Google Drive or YouTube.

9.1.3.2 Usability problems

Many trainers experienced problems with uploading videos, see ID 1-4. Sometimes these problems were caused by a lack of digital skills and knowledge. On the other hand, trainers also experienced technical problems.

Some features that were created in the web-based platform, were not yet implemented in the SALSA Fun app (ID 8 -9): exercise filter on 'Sport' and preview picture of each video.

Table 37 Usability problems

ID	Who?	Usability problem	Solution
1	Trainer	How to upload a video made on your phone, via your computer/laptop to the platform?	<ul style="list-style-type: none"> - Use SALSA Fun app. - Clear instructions on how to forward your video to your computer (e.g. uploading in Youtube, Google Drive)
2	Trainer	Uploading video stopped and user returned to the form where his previous answers were gone.	➔ Technical issue
3	Trainer	After uploading an exercise video, this new video is often not directly visible in the overview. Therefore, trainers thought something went wrong and started all over again.	➔ Technical issue
4	Trainer	Uploading video from computer was only possible by putting it on YouTube first and uploading this link. Trainer mentioned that he did not come in 'finder/folder' so he could not find the video.	➔ Technical issue?
5	Trainer	Changing team photo: when clicking on 'edit' at a team, you cannot see the main photo of this team in order to change it. However it is possible to upload a new team photo, but since you do not see a preview of the current picture one trainer concluded that you have to delete the entire team and create a new one in order to be able to change the picture.	Preview of team photo at edit mode.
6	Trainer	App: creating activity failed. The trainer had filled in all fields but the 'Teams' field appeared red and he was not able to finish the process: Team * 	➔ Technical issue?
7	Trainer	One trainer forgot to save his training and lost all his writing.	He suggested to place the 'save button' higher so it cannot be missed.
8	Trainer	App: you cannot filter the exercises based on sport.	Adding filter 'Sport' like the webbased platform has.
9	Trainer	App: only YouTube videos have a preview picture in the list of exercises. Other videos have a white starting screen.	Adding preview picture of all videos like the webbased platform has.

10	Trainer	Exercise videos are not always visible, even videos uploaded by yourself. Two trainers experienced this, one on both computer as in the app. The other trainer only in the app.	→ Technical issue?
11	Trainer	The example videos do not always play smoothly	→ Technical issue?
12	Trainer/ senior participant	What does hivor mean? After registration a trainer did not understand what he registered for. One senior participant did not understand why she could not login with her SALSAs account.	- Create own chat functionality in which you do not have to register again. - Or clearly explain why registration is needed.
13	Senior participant	Not clear that you need to create your own account. Participants started searching for activities in their region.	Explain the possibilities on front page
14	Senior participant	On the front page one quote was not yet included. One participant noticed the basic 'Lorum ipsum' text.	Add quote of one of the participants.
15	Substitute trainer	Filter of number of participants and duration does not make sense.	Delete these two filters.

9.1.3.3 Usability risks

Based on their experiences at other platforms like ASM (Athletic Skills Model), some trainers mentioned usability risks in case the platform gets larger. At this point they did not experience any problems on these points but noted them to take into account in the future development and exploitation of the platform:

- Risk of long uploading time when the video database contains large amount of videos.
- Risk of getting the same exercise in 10 different videos, thereby contaminating the platform. The only way to prevent this is to monitor this from the start.
- The more filters you add, the slower the platform might get. After adding new filters, the effect on loading time of the platform should be tested.

9.1.3.4 Logical - preferences

Trainers mentioned some features or ways of working of the platform that did not feel logical.

Table 38 Preferences trainers

#	Who?	Current situation	Preferred situation
1	Trainer	Creating videos on your phone and uploading them via computer to platform.	Creating and uploading videos directly on your phone
2	Trainer	In app it is only possible to create one activity at a time. It is possible to copy one activity and change the date, but this will still take a lot of time to do this for a whole year.	Creating one activity in which a pop up calendar appears where you can select all dates when this activity takes place.
3	Trainer	Uploading pictures one by one takes lot of time.	Uploading multiple pictures at once.
4	Trainer	In app on the home screen you cannot directly find the place where the exercise videos can be found and uploaded. This is only visible via the menu.	On the home screen direct link or explanation about the existence of exercise videos, because this is most important for trainers.

5	Trainer	Only filters are cooling down, exercise form ('spelvorm') and warming-up.	More filters options: coordination, balance, exercise form with/without material.
6	Trainer	No overview of latest uploaded videos.	Category 'new', recently uploaded videos, uploading date or mark that you have not viewed this exercise yet, so that you know which videos you have not seen.
7	Trainer	No push notification when new members have joined your team or activity or when new messages are placed in an activity.	E-mail or other notification so that the trainer can respond quickly to messages/questions of members or to send a welcome message.
8	Senior participant	Unclear that you need to register.	

9.1.3.5 Quality is key

During the focus groups we noticed that most trainers stressed the importance of monitoring the quality of content that is placed on the platform. Some trainers explained that they check their own videos, trying to avoid shaky hands while filming or background noise. One trainer even said to do a member check before posting his videos:

"And I tune in myself with trainer X and trainer Y. We show everything to each other, what we are filming, what we are testing and filming. And what is useful and what we can improve. Because I think it's such a shame if I post rubbish. I think it should just be good quality."

Others recommended to appoint a moderator for the exercise part of the platform to monitor the quality of the uploaded videos. When asked to elaborate on the quality aspects of the videos, trainers came up with the following requirements:

- Only short videos of 10-15 seconds, with clear description of the exercise. This explanation should be checked: does it contain a clear description of the goals and intentions of the exercise. Not only the practical explanation of how to perform the exercise.
- Correct labels/filters for that exercise: is it placed in the right category?
- Preventing duplicate videos: exercises that are already on the platform.
- Avoid background noise / loud voices etc. It could even be considered to allow only videos without sound in case you only show people doing the exercise.
- Trainers who are allowed to post videos should have completed the ASM course. In that way they know what aspects are important to put in the description as well. It does not necessarily have to be a professional trainer like the example movies on the platform.

However, one trainer also mentioned to be careful not to become too strict in all requirements. This might scare trainers to place their content.

"I do think it's powerful if there's more content on the platform as well, and for that I think it's good to keep it a little low key."

As an alternative to a central moderator, one trainer suggested to work with 'likes' just like Facebook. If a trainer likes an exercise video, he can give it a 'like' and you can filter on videos that got the most likes. This could also be a form of quality check. One step further could also be to let trainers 'dislike' videos. Every few months a central moderator could check the videos that received 4-5 dislikes and remove it from the platform.

9.1.4 Workflow efficiency

To measure the self-efficacy of the trainers in performing their tasks, we used the New General Self-efficacy Scale⁹ in T1 and T3. Respondents scored ten statements on the extent to which each statement applies to them. The higher the score they gave, the greater the individual's generalized sense of self-efficacy. There is no hard cut-off point. On average the trainers scored 4,2 in T1 and 3,9 in T3, meaning that they had a high sense of self-efficacy.

Fit between Individual and Task

The topic 'Fit between individual and task' describes the fit between the individual user or user group (trainers) and the tasks and working procedures that have to be completed by the user and that are supported by the system.

Trainers use the platform in preparation of their trainings and/ or to share exercises with other trainers. Regarding the training preparation, trainers explained that they do not have a fixed moment during their preparations in which they would look at the platform to gain inspiration for training exercises. Instead most trainers would visit the platform at random to get inspired. One trainer mentioned that it would be helpful to get a message or e-mail when new content is placed, as a trigger to take another look at the platform.

The other task concerns sharing their own knowledge to other trainers by making videos of exercises and putting them on the platform. One trainer said that he would watch some videos on the platform before starting to film himself. As an example of how to create proper videos yourself. Trainers also expressed the need for assistance in filming exercises. As they do not have many filming experience and they are often giving training at the same time so they need extra hands. Although they wanted assistance, for quality reasons mentioned earlier they said that they should always be involved in uploading the final videos.

For other platform features, many trainers indicated the need for access to the platform for their assistant trainers or club members who assist in organisational aspects of a training/team. They mentioned various tasks by which this could be useful: inviting new team members to join their team and monitor if registration goes well and adding activities.

Fit between Task and Technology

The topic 'Fit between task and technology' describes the fit between the system that is needed to accomplish a given task and the tasks and working procedures that have to be completed by the user and that are supported by the system.

Trainers mentioned that they needed to adjust their working routines, mainly regarding the filming of exercises to upload on the platform. They mentioned that it was important to prepare the exercise video you want to shoot: what do I want to show and how? In case you want to film during a regular training with a subgroup, assistance in filming is needed since the trainer has to continue the regular training with the other participants. Another solution that was provided by one trainer was to schedule another moment where you film several exercises with a small group, instead of during the regular training.

Fit between Technology and Individual

This category describes comments related to the fit between the system that is needed to accomplish a given task and the individual user or user group (patients or therapists) of that system.

⁹ Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35- 37). Windsor, England: NFER-NELSON.

In general the features on the platform match the expectations of the trainers. They often compared it with another platform that already exists from ASM. The ASM platform was described as way less useful because it contains a large amount of exercises that are not applicable to Oldstars trainings. Furthermore, these videos are presented in a chaotic way because there is too much content on the platform. In addition, the platform of KNVB (Royal Netherlands Football Association) was said to be less clear and user-friendly as the SALSA Fun platform. Other comparable systems to gain exercise inspiration that were mentioned were: multi-skillz platform (Belgium), Youtube and internet. One trainer was in favour of the multi-skillz platform as he described ASM as rather vague and abstract, and multiskillz gave the further interpretation of these terminology.

9.1.5 Quality of training

In general, the older adults did not experience differences in the trainings or a change of quality of their trainings. The three Oldstar teams who joined the study all had experienced trainers. These trainers mostly used the platform to provide exercise content for other trainers, instead of gaining inspiration for new exercises which they could use themselves. Only one older adult noticed a new exercise during one of the trainings which turned out to come from the platform. This exercise was noticeable due to the balloons that were used as material.

9.1.6 Quality of life and physical fitness

To measure quality of life, we used the EQ-5D-5L questionnaire. In addition, to measure the added value of SALSA Fun on physical fitness we used the six minutes walking test (6MWT). Both outcomes are summarized in Table 39. Seven persons experienced slight problems in walking. 34 persons reported to have slight pain or discomfort, and 2 persons reported to be slightly anxious or depressed. Nobody had problems in self-care or usual activities.

On average the senior participants walked 591 meters in T1 and 620 meters in T3 within 6 minutes. The participants who joined the six minutes walking test in T3, all increased their scores on average with 89 meters (minimum 40 meters – maximum 147 meters).

Table 39 Summary of EQ-5D-5L questionnaires and 6 minutes walking test

Participant	T1			T2		T3		
	Health score	Daily score	6MWT (meters)	Health score	Daily score	Health score	Daily score	6MWT (meters)
A30	11111	95	629					
AA4	11111	80	660	11111	77	11111	84	
AC2	11111	85	640	11111	85	11111	80	
AD1	11121	75	610					
AE26	11111	85	610					
AG24	11121	80	630	11111	80	11111	80	
AJ21	11121	80	494	11111	77	11111	76	
AM18	11111	80	544	11111	80	11111	90	
AP15	21131	80	536					
B29	11121	95	671	11121	90	11121	90	
C28	11111	100	629					
D27	11121	80	710	21121	80	11121	80	
E26	11121	95	629	11111	95	11121	95	
F25	11111	100	634					
G24	11121	70	628	11121	75	11121	75	
H23	11111	80	668	11121	88			
I22	11121	70	668			11111	78	
J21	11121	95	618					
K20	11121	90	628	11121	100	11111	92	
M18	11121	80	480	21121	75	21121	75	520

N17	11111	80	570	11121	85	11111	80	671
O16	11121	60	563	11132	77	11122	78	710
P15	11111	90	480					590
Q14	11121	80	560	11121	90			670
R13	11111	90	563	11111	84	11121	93	
S12	11111	80	492	11111	100	11111	100	532
T11	11111	90	570	11121	95	11121	90	680
U10	11111	100	570	11111	100			670
V9	11111	90	516	11111	90	11111	90	580
W8	11111	100	516	11111	100			580
X7	11111	80	560					
Z5	11111	85	660	21121	80	21121	80	
Average		85	592		85		84	620
Min		60	480		75		75	520
Max		100	710		95		95	710

The red scores are not included in the average scores because those participants were excluded because they did not fill in all questionnaires of that measurement moment or previous measurement moments. The scores of the 6MWT however were included because of the limited available data of this test.

9.1.7 Willingness to pay

All participants filled out a willingness to pay questionnaire at the end of the field trial. All senior participants answered that they did not want to pay for the platform. In addition, most trainers responded the same. Eight trainers did not want to pay. Only three trainers answered that they wanted to pay a maximum of 5 euros a month.

The outcomes of this questionnaire were further elaborated on during the final focus groups with the trainers. One of the reasons for not wanting to pay for the platform was the fact that some trainers are training on voluntary basis, so they do not get paid for their job. This in combination with their years of experience in providing training made them not interested in paying for an online platform. Moreover, they found it strange that you have to pay for a platform where you have to provide part of the content by yourself without getting rewarded for that. Such a payment system would not stimulate trainers to upload content, as one trainer said:

"And if you have to pay you will only just go and get it [content on platform]."

Other suggestions included letting sports federations invest in it or combining access to the platform with a paid training or course on the platform. The option of letting sport clubs pay for their trainers' access to the platform was not favoured either. Trainers explained that an Oldstar team is often just one of the many teams of a club. Therefore, investing in a platform specifically for this small subpopulation within a club would probably not work.

9.2 Austria

9.2.1 Participants / demographics

From mid-June to mid-October 21, a walking sports training took place every Wednesday on a sports field in Bad Schallerbach, a well-known spa resort in Upper Austria.

In total a number of about 12 participants took part in these trainings. Some only came one or two times, some did not want to participate in the study. Only one person was there from start to finish.

Five persons (2 male, 3 female) agreed to sign the informed consent and do the 6MWT. Of those five only 2 filled in the T1 questionnaires. Of those two one was male, one female, they were aged between 50 and 60 and 70 and 80. One lived alone, the other with partner. Highest education being vocational training and Matura (A-level).

Both trainers - one a professional sports trainer (9 yrs.), one a layman trainer (5 yrs.) - were men in their fifties and sixties. Both are academics, living with partners.

9.2.2 Use

Both trainers were involved in the testing activities of the pre-test phase, so they already knew the platform quite well and were able to use the app without further help by the project partners.

The two trainers registered on the SALSA Fun platform and created a group. They stated, that they wanted to use the app mainly to publish the training events and to know in advance who would be attending. The professional trainer explicitly mentioned, that he would not need the training videos and that he does not intend to upload own content. He considers his training ideas as intellectual property and competitive advantage. He does not necessarily want to pass them on free of charge.

The layman trainer was mildly interested in the provided training videos and the possibility to upload own content. He eventually uploaded a couple of photos for the group page but no training videos.

Although there was some interest by the trainers in the chat functionality to communicate with the participants, it could not really be tested, as the app was not used by the participants:

The participants were repeatedly invited to use the SALSA Fun app and project partners were at all the trainings to help in case of problems, but in the end only 2 participants signed up and took a short look at the platform. As a matter of fact the app was not used by the participants at all.

From conversations with the participants and the final interviews, the main reasons for not using the app were:

- There was no real need to use it, as all the training events took place at the same place at the same time.
- Not using the app had no consequences (the trainers did not urge them to use it, they could participate even when they did not register).
- Some participants just did not want to use another app, where they had to register first or do not like to use too many different apps in general.

Remark: The professional trainer also used the app outside the pilot for organising yoga classes. Yoga classes only take place, if at least 4 participants subscribe for an event. If there are less registrations, an event is automatically cancelled. As a consequence, and contrary to the walking sports group, the app was used by the participants of the yoga classes on a regular basis, if again only exclusively for registering for classes.

9.2.3 Usability

The app was perceived as easy to use by the trainers. Help was not really needed. Complexity is low. The basic functionality for managing events is clear and straight forward, the system is stable and reliable. The visuals are clear and “tidy”, appropriate for users 55+ (professional trainer); maybe a bit “too sober” and the “text font could be more pleasing” (layman trainer).

The SUS scores from the trainers taken at the end of the pilot (T₃) yield the following results (max score=100):

Table 40 SUS scores

	Score
Trainer 1	85
Trainer 2	90

The results are good, but should of course not be overestimated, as the platform was almost exclusively used for publishing events and important features like sharing training videos or chat were not used at all.

As said before, the platform/app was not used by the Walking Sports participants. Some got discouraged right from the start, when they entered the url www.salsa-fun.web.app and learned, that the site was insecure and probably dangerous (salsa-fun.web.app without **www** would have been correct and led to the SALSA platform). Those who registered, only took a quick glance and did not really use it (see reasons above).

Yoga participants used the app for subscribing for yoga classes and checking, whether a class was cancelled or not. They generally found the app pretty simple and clear, did not need any help and liked the visuals.

Both trainers came up with a list of usability problems that they encountered.

Table 41 Usability problems

ID	Usability problem	Solution
1	Newly uploaded content (e.g. events) takes unexpectedly long to be displayed, sometimes the order of events is not correct at first. Sometimes multiple entries (e.g. participants list)	Improve refresh speed
2	Icons missing	Icons added
3	Push notifications missing	Push notifications shall be added
4	Past events are deleted immediately once they have taken place	Past events are archived and can be re-used as templates
5	Trainer is counted as participant	Trainer is no longer counted as participant
6	Manage members functionality not clear	More management functions needed (at the moment you can only delete members)
7	There were some problems with registering in the beginning.	Wrong link was used
8	Data privacy problematic, as every SALSA user can see email address of all other SALSA users	Profile setting: do not show email implemented

9.2.4 Workflow efficiency

The NGSES scores from the trainers taken at the start (T₁) and the end of the pilot (T₃) yield the following results (max score=40). The younger, professional trainer scoring the max number, the older layman trainer still reaching a good score of 32. There is no change in the answers at the different measurement points indicating any influence by the SALSA platform:

Table 42 NGSES scores

	T1 Score	T3 Score
Trainer 1	40	40
Trainer 2	32	32

Fit between Individual and Task

The trainers used the platform for scheduling events. The professional trainer mentioned that it would be absolutely necessary to have push notifications here. The most important criteria for him for using or not using the app is the improvement of the workflow. The need to actively check in the app whether there are enough registrations inhibits the workflow. In general, the app replaces other solutions like WhatsApp for organising events, it reduces organisation time and improves overview.

As mentioned before, the professional trainer considers his training ideas as intellectual property and competitive advantage. He does not really want to share these ideas free of charge by uploading training videos. He would be interested to share (e.g. Yoga-)videos with the participants.

Fit between Task and Technology

Both trainers state, that regarding the management of sport events (publish events, get informed about the number of registrations, cancel events) the app offers good functionalities and (could) simplify this process. Also the FAQ section was mentioned positively. On the other hand, some important features are definitely missing and would improve the workflow significantly:

Table 43 Missing functionalities

ID	Missing functionalities
1	Push notifications: it does not improve the workflow, if you have to open the app every time, to check whether there are registrations or cancellations, ...
2	Members/participants can be added by the trainer (in case, a participant does not want to use the app and for contact tracing)
3	Waiting list feature for events with max. participant size
4	Feature "Serial event" for publishing a series of events
5	Evaluation functionalities for past events
6	More functionalities for group member management (list view, export list, group mail, ...)
7	Payment system
8	Share exercise videos with participants

Fit between Technology and Individual

In general, the basic features on the platform match the expectations of the trainers. They also mentioned WhatsApp as established form of group communication, but see benefits in a dedicated platform like SALSA, when the functionalities are tailored to their specific needs. They would both recommend the app to other trainers with similar needs and would like to use it after the pilot.

9.2.5 Quality of training

The trainings always followed the same structure as suggested by the Oldstars Walking Sport experience: A playful warming-up session including partner and group activities was followed by a football or basketball match. A short cooling down phase concluded each training. Using a wide variety of different balls (big – small, light – heavy, round – egg shaped, ...) added extra fun to the activities.

The basic tenor of the participants was that they liked the trainings very much. This statement was heard quite often and spontaneous during the trainings. Many had not held a ball in their hands for

years. The warm-up exercises were appreciated because of the variety and playful character, and many of the participants showed real ambition in the game forms.

One participant mentioned positively that the trainers were responsive to the participants, another important aspect of the Walking Sports concept to respect and take up the wishes and needs of the elderly participants: Whereas at the beginning the focus was on soccer, during the pilot phase more basketball was played, at the request of especially female participants.

Asked, which functionalities the participants would like to see in the app to support them better, yields the following list (n=3, also including Yoga practitioners). Interesting to see, that the communication functions are not really requested, but that some would additionally like to have video exercises for home training.

Table 44 Preferred functionalities of the app by participants

ID	Function	f
1	Event finder	3
2	Register for an event	3
3	Get exercise videos from trainer	1
4	Exercise library for home training	1
5	Link with calendar	1
6	Chat with trainer/group	0
7	Share photos	0

9.2.6 Quality of life

Participants who regularly attended the training sessions for some time stated, that they noticed progress in the exercises. What was difficult and unfamiliar at the beginning was now easier for them.

The results from the 6MWT at T₁ (n=5) ranged from 575 to 729 (MV=656, SD=64,9). Due to the high drop-out rate the 6MWT was not repeated at T₃.

The same holds true for the EQ-5D-5L, which yielded perfect scores of 11111 at T₁.

Table 45 Summary of EQ-5D-5L questionnaire

Participant	T ₁		T ₂		T ₃	
	Health score	Daily score	Health score	Daily score	Health score	Daily score
ATSF01	11111	80	-	-	-	-
ATSF06	11111	100	-	-	-	-

Although the majority of participants stated that they liked the trainings, the drop-out rate was extremely high. For some, the date was unsuitable, others went on holiday for a longer period of time or ended their participation due to health problems (not related to the trainings). So as a consequence it was hard to establish a group feeling and to deepen relationships among participants.

9.2.7 Willingness to pay

The professional trainer stated, that the Covid-19 pandemic poses a particular financial challenge. He would have to calculate very precisely what he could spend for the use of the app and said he was unable to give a number at the moment.

The layman trainer said, that there are similar organiser apps, often for free. Whatsapp is great for communication with participants and also for free. So it will be hard to charge too much money for the app. He would pay around 5,- for the app as a one-time payment. Participants stated, that they would pay for the trainings, but not for using the app.

9.3 Switzerland

9.3.1 Participants / demographics

The SALSA Fun study was integrated into the internal campaign on the topic of "Fit for Summer". In the process, precisely the three sports offerings already mentioned above were listed and offered with their own courses. Although the three courses were partly more partly less well received, it was very difficult to recruit participants for the field test for SALSA Fun. The three trainers made every effort to draw attention to the platform, unfortunately without success. While the trainers used the platform to encourage the course participants, unfortunately they did not find the desired way to it. After repeated calls, Facebook ads, and newsletters, a Plan B was launched.

This included a small survey on the topic of social platform for sports groups. 91 people took part in this survey. The majority stated that they mainly arrange meetings via existing channels such as WhatsApp groups or the normal telephone. Since the field study fell directly into the Corona pandemic, some courses were not offered or moved to the net. About half of the participants indicated that the courses had not taken place and that they had not arranged to meet other participants outside of the course session. When asked if they could imagine arranging to meet on a platform like SALSA Fun for joint sports activities, the majority said they could not.

Various measures were taken to publicize SALSA Fun and get it up and running. In order to promote the SALSA Fun platform in the best possible way and to encourage users, the project was linked to an internal campaign of the terzStiftung. This campaign included the same sports that were offered through SALSA Fun. A total of 3 sports were embedded: stand-up paddle, Qi-Gong and fitness groups for seniors.

For each of these 3 groups, classes and groups were created in the SALSA Fun app so that participants could interact and socialize outside of class times. As is known, these groups were not accepted as desired, because existing channels such as WhatsApp groups or email distribution lists were used due to the lockdown caused by the pandemic. To encourage participants to use them, 7 exercise videos were made in each sports group. These were uploaded to the project homepage at regular intervals of 2 weeks and linked to the SALSA Fun community group. These efforts also did not show the desired success. In addition, regular newsletters and postings on Facebook were made to promote the SALSA Fun platform. In the end, only the trainers used the platform.

A total of 8 newsletters, 4 newspaper stories and 27 social media posts were published.

Unfortunately, in the end, none of the measures and efforts taken had the desired effect. While the trainers used the platform (at least in the beginning), unfortunately none of the course participants could be won over. Since no participant wanted to use the platform, the trainers also stopped using it after a while.

10 Conclusions SALSA Fun

10.1 Netherlands

The pilot results of The Netherlands show that trainers saw potential in the use of the Salsa Fun platform. They found a source of inspiration in the exercise videos on the platform, which enhanced their creativity in composing an interesting and fun training. The usefulness of the registration feature for participants was only seen by a small group of trainers who were professional trainers with many teams in different clubs.

Although the trainers saw potential in the platform, the pilot study also showed that there are still many usability issues that need to be solved before it can be implemented on a large scale. The low SUS score confirmed that the platform is not mature enough. It will need extensive improvements. In addition to these technological issues, trainers had some concerns about the amount of extra work they had to perform to create exercise videos for the platform with good quality. This resulted in the fact that trainers showed no willingness to pay for the Salsa Fun platform.

The older adults themselves did not see the added value of the platform. They were often satisfied with the current way of communication with each other and their trainer via Whatsapp. The only potential they saw was for their peers, who are searching for a walking sports community to join. The platform, when filled with proper information, could provide a useful overview of activities in a municipality.

10.2 Austria

The Austrian pilot showed that testing a community platform (for walking sports) without having an established community first is not very successful. The communication functionalities and possibilities to share comments and photos are not used, when there is not a sufficiently large number of participants. And when there is no real need to use a new platform, well known means like WhatsApp are used instead. Further incentives with clear advantages over existing communication channels were missing.

The same holds true for the trainers. There was too little content in form of training videos provided on the platform and with only two trainers there was no motivation to upload own content and share it. Furthermore, trainers did not want to share their exercise ideas as they saw it as their intellectual property.

Although trainers saw benefits in the platform for managing sport activities and basic functionalities worked sufficiently well (e.g. publishing events), important features for advanced event and member management were missing.

10.3 Switzerland

The acceptance of SALSA Fun was non-existent throughout the trial period, with no single user registering. Considering that SALSA Fun was prominently linked to campaign website that was heavily advertised in the recruitment phase and considering that this latter peaked in terms of website visits, possible reasons had to be identified. The subsequent survey among 91 participants from the target group found that the community page would be in competition with existing channels for informal organization of sports groups (e.g. social media). SALSA Fun did not add any distinct value.

11 Overall conclusions

11.1 SALSA Health

In the Netherlands and Switzerland all patients and therapists at the start of the field trial were enthusiastic to use SALSA Health. Unfortunately this attitude diminished during the use of SALSA Health over a longer period of time. Main factors were usability issues, arrangement of exercises, long-term motivational incentives and lack of newness in the exercises. Therapists and patients however saw potential in using SALSA Health at home, to support self-management of the patients and keep them active outside of the therapy. In order to make this happen attention should be put to making the system more intuitive and self-explaining. It should be easy to use and free of inconsistencies. The implementation of webcam tracking would be ideal so that patients can get feedback on the correct execution of exercises also at home and without a therapist present.

Due to changes in the Medical Device Regulation in Austria SALSA Health was finally tested in the setting of healthy older workers at the computer workplace in the office and in home office. The study showed some signs of health improvements for users of the SALSA Health app. The physiotherapist finds the system suitable for promoting health and strengthening the musculoskeletal system but would rather not use SALSA Health in the therapy of patients with clinical (painful) symptoms because the movements were too unspecific. Further improvements on the app should be executed, as especially technical problems marred the overall user experience.

11.2 SALSA Fun

Overall it can be concluded that the SALSA Fun platform in its current form has too little added value and is not mature enough to be implemented in practice. First of all, the older adults at all pilot sites did not see the added value of such a platform compared to their current means of communication with each other via social media and Whatsapp. Although the platform was linked to a large sport campaign in Switzerland, the original pilot could not take place because no users registered for the platform.

The other pilots demonstrated that there could be some added value for the trainers platform e.g. subscription tool to manage participants (Austria) and sharing exercise videos amongst trainers (Netherlands). However, there are still many usability issues and missing functionalities that need to be solved before the platform can be used. Achieving these developments get complicated since trainers and clubs did not show any willingness to pay for the platform.

12 Discussion

In this chapter we provide some reflections about the outcomes of the pilots. Because all pilots turned out to be executed in a slightly different manner, it was hard to create a general discussion. Therefore, the discussion points below are merely focussed on individual pilot outcomes.

12.1 SALSA Health

Interest went down when the newness went off

Patients were enthusiastic about SALSA Health at the start of the evaluation in the Netherlands and Switzerland. However, over the course of the study the initial interest wore off. At this point, SALSA Health could have become a regular part of the training, like treadmills and other exercises that the patients use, but are maybe no longer very enthusiastic about. However, several issues prevented this from happening. First, the usability issues like faulty error messages frustrated patients and made them less likely to use the system. Certain arrangements in the system were also still in prototype quality. Secondly, devices like treadmills could be used autonomously by the patients, they could select their own program and change the difficulty. With SALSA Health, a therapist needed to be present to start and set up the system for them. This increased the threshold for using the system. Therefore, it was mentioned that the system is currently not very useful for training at the physiotherapist.

Use of SALSA Health at home

An opportunity that both patients and therapists in the Netherlands pointed out was to make use of SALSA Health at home. For COPD patients, keeping active outside of their therapy is crucial and hopefully SALSA Health could help them with this. However, in the Netherlands there were problems setting up the 'at home' accounts, which would need to be resolved to allow for actual testing of the system at home. Trends towards health improvements for users of the SALSA Health app have been found in the investigated cohort in the Austrian pilot as well. Nevertheless, as usability, user experience and satisfaction was noticeably lower than comparable interventions in the medical or therapeutic field, and as every user complained about technical problems, software bugs or other technical problems, further improvements on the app should be executed.

Additionally, there are patients for home use where this is not feasible because they do not have a laptop or computer at their disposal. If a physiotherapist wants to use SALSA Health at home they could therefore only do so for patients with a sufficient device, or consider providing a device to their patients, which of course comes with additional costs.

As the small sample size limits the generality of the results, further studies with larger cohorts that are based on a priori sample size calculation and stringent study protocol should be executed.

12.2 SALSA Fun

Creating a strong community

When comparing the results of the three pilot sites including the recruitment issues for SALSA Fun, it can be concluded that it is important to invest in creating a sports community first before implementing a platform. You need to have proper content to share with each other and a community of people who are interested in learning from each other.

The Austrian pilot showed that recruiting trainers for both implementing a new type of sport and testing a new platform that in potential could support them was probably too much to start with. In addition, trainers did not want to share their exercise ideas as they saw it as their intellectual property.

In comparison, in the Netherlands there are already many walking sports teams and trainers. Therefore trainers have experience in training older adults and the type of adaptation that is needed in order to create proper training exercises. Their experiences and needs are key for creating content on the platform. Furthermore, Dutch trainers had an open attitude in sharing their knowledge instead of protecting it.

On the positive side, it should be noted that the concept of walking sports as practiced in the Netherlands was also great fun for the Austrian participants and these experiences make us confident that a corresponding initiative could also be successful in Austria.

Last but not least, it should be mentioned that the Corona situation of the last two years has been quite challenging, especially regarding group activities for senior participants. Especially in Austria, where corresponding groups were to be formed first, the application and recruitment phases were very difficult. Recurring lockdowns stifled first successful commitments and events, the constant uncertainty deterred potential multipliers such as initiatives and associations.

Differences in type of sports

The different pilots showed an unequal affinity of the test persons to organize their activities in SALSA Fun. An explanation for this may be directly related to the type of sports and the inherent characteristics thereof. One may hypothesize that individualistic activities like Qigong or SUP will require less coordination than group activities like walking football. In the SUP courses, for example, a great deal of coordination took place between coaches and course participants, yet on a highly bilateral level. Many participants were interested to express their particular concerns or request customized course contents that are irrelevant for the larger group. It would be interesting to further study this hypothesis as this was beyond the scope of the focus put on the trail period.

Workflow efficiency

It can be concluded that Dutch trainers needed to invest time and effort into creating and uploading the exercises onto the platform. Furthermore the use of the platform didn't change anything concerning their workflow. It didn't have a positive effect. They also mentioned that the quality of the content is crucial. The exercises need to be clear, easy to follow and filmed properly. With these results NFE questions if we need to include a separate film crew who will film these exercises together with trainers. Therefore trainers don't have to invest time into the filming and quality is guaranteed.

13 References

1. Larsen, D. L., Attkisson, C. C., Hargreaves, W. A., & Nguyen, T. D. (1979). Assessment of client/patient satisfaction: Development of a general scale. *Evaluation and Program Planning*, 2(3). [https://doi.org/10.1016/0149-7189\(79\)90094-6](https://doi.org/10.1016/0149-7189(79)90094-6)
2. Janssen, M. F., Pickard, A. S., Golicki, D., Gudex, C., Niewada, M., Scalone, L., Swinburn, P., & Busschbach, J. (2013). Measurement properties of the EQ-5D-5L compared to the EQ-5D-3L across eight patient groups: A multi-country study. *Quality of Life Research*, 22(7). <https://doi.org/10.1007/s11136-012-0322-4>
3. Brooke, J. (1996). SUS - A quick and dirty usability scale. In I. L. M. (Eds. . P.W.Jordan, B. Thomas, B.A. Weerdmeester (Ed.), *Usability evaluation in industry* (pp. 189–194). Taylor & Francis
4. Lewis, J. R., & Sauro, J. (2018). Item Benchmarks for the System Usability Scale. *Journal of Usability Studies*, 13(3), 158–167. http://uxpajournal.org/wp-content/uploads/sites/8/pdf/JUS_Lewis_May2018.pdf
5. Fitzgerald, A., Huang, S., Sposato, K., Wang, D., Claypool, M., & Agu, E. (2020). The Exergame Enjoyment Questionnaire (EEQ): An Instrument for Measuring Exergame Enjoyment. *Proceedings of the 53rd Hawaii International Conference on System Sciences*. <https://doi.org/10.24251/hicss.2020.416>
6. Costello, E., Kafchinski, M., Vrazel, J., & Sullivan, P. (2011). Motivators, barriers, and beliefs regarding physical activity in an older adult population. *Journal of Geriatric Physical Therapy*. <https://doi.org/10.1519/JPT.obo13e31820e0e71>
7. Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35- 37). Windsor, England: NFER-NELSON.

14 Appendix 1 – Demographic data senior participants SALSA Fun - NL

This table shows the summary of demographic data of the senior participants from the Netherlands in the SALSA Fun pilot.

ID	Age	Gender	Educational level	Type of walking sport
A30	70-80 year	Male	Lower vocational	Walking Football
AA 4	70-80 year	Female	Academic education	Walking Hockey
AC2	60-70 year	Male	Academic education	Walking Hockey
AD1	70-80 year	Male	Post-secondary vocational education	Walking & Walking hockey
AE26	70-80 year	Male	Academic education	Walking Hockey
AG24	60-70 year	Female	Higher vocational education	Walking & Walking hockey
AJ21	60-70 year	Male	Academic education	Walking Hockey
AM 18	60-70 year	Male	Academic education	Walking Hockey
AP 15	70-80 year	Female	Higher vocational education	Walking Hockey
B29	70-80 year	Male	Lower vocational	Walking Football
C28	70-80 year	Male	Lower vocational	Walking Football
D27	70-80 year	Male	Lower vocational	Walking Football
E26	70-80 year	Male	Lower vocational	Walking Football
F25	60-70 year	Male	High school degree or equivalent	Walking Football
G24	70-80 year	Male	Post-secondary vocational education	Walking Football
H23	60-70 year	Male	Higher vocational education	Walking Football
I22	70-80 year	Male	Higher vocational education	Walking Football
J21	60-70 year	Male	Lower vocational	Walking Football
K20	60-70 year	Male	Post-secondary vocational education	Walking Football
M 18	60-70 year	Female	Higher vocational education	Walking Handball
N 17	60-70 year	Male	Academic education	Walking Handball
O 16	60-70 year	Male	Academic education	Walking Handball
P15	60-70 year	Female	Lower vocational	Walking Handball
Q14	60-70 year	Female	Higher vocational education	Walking Handball
R 13	60-70 year	Female	Post-secondary vocational education	Walking Handball
S 12	70-80 year	Female	Lower vocational	Walking Handball
T 11	60-70 year	Male	Higher vocational education	Walking Handball
U 10	60-70 year	Male	Post-secondary vocational education	Walking Handball
V 9	Older than 80 year	Male	Post-secondary vocational education	Walking Handball
W 8	70-80 year	Female	Post-secondary vocational education	Walking Handball
X 7	70-80 year	Male	Post-secondary vocational education	Walking Hockey
Z 5	70-80 year	Female	Post-secondary vocational education	Walking Hockey