Title

iSARAH: A web-based training resource for therapists to deliver an evidence-based exercise programme for people with rheumatoid arthritis of the hands and wrists

Abstract

Background

The Strengthening And Stretching for Rheumatoid Arthritis of the Hand (SARAH) is a tailored, progressive exercise programme for people having difficulties with wrist and hand function due to rheumatoid arthritis (RA). The programme was evaluated in a large-scale clinical trial and was found to improve hand function, was safe to deliver and was cost-effective. These findings led to the SARAH programme being recommended in the National Institute for Health and Care Excellence (NICE) guidelines for the management of adults with RA. To facilitate the uptake of this evidence-based programme by clinicians, an online course (iSARAH) was proposed to educate/train physiotherapists and occupational therapists on delivering the SARAH programme in their practice.

Objectives

The overall iSARAH implementation project was guided by five phases of the ADDIE (A-Analysis; D-Design; D-Development; I-Implementation; and E-Evaluation) system design model. This paper describes first three phases of the model.

Methods

Following publication of the trial, the SARAH programme materials were made available to therapists to download from the trial website for use in clinical practice. 35 therapists who downloaded these materials completed an online survey to provide feedback on current practice trends in prescribing hand exercises for people with RA, perceived barriers and facilitators to using the SARAH programme in clinical practice, and their preferences for the content and web features of iSARAH. The development and design of iSARAH were further guided by a team of multi-disciplinary health professionals (n=17) who took part in a half-day development meeting. The preliminary version of iSARAH was developed and was tested in therapists (n=10) to identify and rectify usability issues and to produce the final version of iSARAH.

Results

The major recommendations made by therapists and the multidisciplinary team included having a simple web design and layout, clear exercise pictures and videos, and compatibility of iSARAH on various browsers and devices. All usability issues in the preliminary version were rectified to develop the final version of iSARAH.

The final iSARAH included four short modules and additional sections on self-assessment, frequently asked questions and resource library. iSARAH went live in April 2017 providing free and unlimited access to NHS therapists registered with the course. An impact evaluation among therapists who completed iSARAH and a service evaluation in people treated by iSARAH trained therapists are ongoing.

Conclusions

The use of ADDIE design model and engagement of end-users in the development and evaluation phases have rendered iSARAH a convenient, easy to use and an effective online learning resource for therapists on how to deliver the SARAH programme. There is also huge potential for adapting iSARAH across different cultures and languages thus opening more opportunities for wider uptake and application of the SARAH programme into practice.

Keywords

Hand function; Hand exercises; Rheumatoid arthritis; Online training; Implementation

Introduction

Rheumatoid arthritis (RA) is a chronic inflammatory joint disease that presents with pain, inflammation, stiffness, and reduced muscle strength, joint movements and joint function [1, 2].

Joints of the hands and wrists are very commonly affected in people with RA [2, 3] resulting in reduced functional ability of the hands [4-7]. The Strengthening and Stretching for Rheumatoid Arthritis of the Hand (SARAH) programme is an individually tailored, progressive exercise programme for people with pain and hand function problems due to rheumatoid arthritis [8, 9]. It includes mobility exercises for the hand, wrist and shoulder and strengthening exercises for the hand and wrist muscles. The exercises are delivered by a therapist with behavioural support strategies for exercise adherence such as exercise diaries, goal setting, action planning, confidence building and problem-solving along with routine advice on joint protection, assistive devices and splints. Between 2009 and 2011, a large, pragmatic multicentre randomised controlled trial evaluated the SARAH programme across 17 National Health Service (NHS) hospitals in the UK [10]. 490 adults diagnosed with rheumatoid arthritis, and who were on a stable drug regimen for at least three months, were randomised to receive either best practice usual care alone or in conjunction with the SARAH programme. Significant improvements in overall hand function and self-efficacy were seen at 4 and 12 months in participants who received the SARAH programme. The programme was also found to be safe and cost-effective [10]. Based on this research, the exercise programme is now recommended in the NICE guidelines for patients with RA affecting their hands [11].

Due to the success of the programme and the NICE recommendations, we are now aiming to disseminate the evidence-based SARAH programme to facilitate its use in clinical practice. In the original clinical trial, therapists attended a face-to-face training session (1/2 to 1-day duration) to learn how to deliver the SARAH programme. Following the publication of the SARAH clinical trial results, all the patient and therapist materials required to deliver the SARAH programme were made available for health care professionals worldwide downloadable from the Oxford Clinical Trials Unit (OCTRU) website [12].

However, we recognised the need for a knowledge dissemination tool with the potential to facilitate wider and systematic uptake of the SARAH programme by physiotherapists and occupational therapists and its implementation in clinical practice. We, therefore, proposed a free online training programme iSARAH [13] to serve this purpose. Web-based training programmes use modern telecommunication and information technologies to deliver information and have the capacity to accommodate multi-modal learning formats (e.g. written materials, multimedia, animations, feedback and assessments) [14, 15]. They can reach many people at their convenience, overcome geographical barriers, and are also cost-effective in terms of time, effort, and travel [15]. Online training has the potential to be an effective method of reaching and training health professionals globally [16-20].

The iSARAH implementation project is based on the Analysis, Design, Development, Implementation and Evaluation (ADDIE) model, one of the common instructional system design models used for constructing Web-based programmes [21-24].

1. Analysis –this stage includes defining the problem, identifying the target knowledge users and looking for possible solutions to bridge the knowledge-action gap and user-specific needs for the dissemination tool. In the context of the SARAH programme, the knowledge-action gap is the evidence-based SARAH programme (current knowledge) and its application in practice (action). The targeted users are the physiotherapists and occupational therapists who routinely treat and prescribe hand exercises to people with RA. We proposed to bridge the knowledge-action gap by educating and training the therapists on the SARAH programme with a knowledge dissemination tool (iSARAH)
2. Design –this stage consists of finding ways to organise and present the content, modes of delivery and developing an evaluation plan of the dissemination tool. This stage involved conceptualising and adapting the SARAH programme to fit the online iSARAH.
3. Development –this stage involves building iSARAH, evaluating its usability issues and refining to develop the final version.
4. Implementation –this stage involves making iSARAH available for NHS therapists.
5. Evaluation –this stage will include evaluation of learning outcomes such as knowledge, attitudes, intention to implement and user satisfaction with iSARAH, and evaluation of actual utilisation of the SARAH programme by iSARAH trained therapists in real-world settings.

This paper aims to describe the first three phases of the iSARAH implementation project.

Methods

Phase 1: iSARAH Needs analysis

Specific objectives of this phase were,

* To explore routine exercise prescription practices and outcomes use among therapists who treat people with RA affecting the hands and wrists
* To identify barriers and facilitators to implementing the SARAH programme
* To collect therapists’ opinions and preferences on the design/content/features of iSARAH

A convenience sample of physiotherapists and occupational therapists of different countries who downloaded the SARAH programme materials from the Oxford Clinical Trials Unit (OCTRU) website and gave permission to be contacted by the SARAH team were considered eligible for participation in the SARAH survey. Willingness to provide consent for taking part in the survey was the other inclusion criterion.

A survey questionnaire (Appendix 1) was developed that focused on routine therapist practice patterns in prescribing hand exercises for people with rheumatoid arthritis, and their experiences of using the SARAH programme in clinical practice since they downloaded the SARAH programme materials. Therapists were also asked about barriers and enablers to using the SARAH programme, and their preferences for the content, design, and structure of iSARAH. Invitation emails with a web link containing information about the survey were sent, along with a consent form and some questions relating to the therapists’ professional background and experience. Access to the survey was allowed for those therapists who provided online consent. Those who consented were asked to complete the survey within two weeks. For non-responders, a reminder email was sent after two weeks, followed by a final reminder a week later.

The survey protocol was reviewed and approved by the medical sciences Inter-Divisional Research Ethics Committee (IDREC) at the University of Oxford (Reference number R43362/RE001). The SARAH survey was developed using Lime Survey, an open source survey tool and was hosted by OCTRU, University of Oxford.

Phase 2: iSARAH Design

Specific objectives of this phase were,

* To design a paper prototype of iSARAH
* To gain feedback from a multi-disciplinary group of health professionals and agree on the content, delivery methods, frequently asked questions (FAQs), and navigation, layout and visual appeal features of iSARAH

The SARAH research team and information technology experts mapped the SARAH programme from the SARAH clinical trial to a 3-4-hour online training package for therapists and designed a paper prototype. We proposed a half-day meeting with rheumatology clinicians, researchers and technology experts based on their convenience and availability to attend the meeting. The purpose of this meeting was to gain collective feedback on the prototype and the survey findings to finalise the design of iSARAH. The paper prototype was presented at a half day multi-disciplinary team meeting (N=17) involving a rheumatologist (n=1), occupational therapists and physiotherapists (n=10; 7/10 were part of the SARAH trial), SARAH trial researchers (n=4), and information technology experts (n=2).

Phase 3: iSARAH Development and Usability testing

Specific objectives of this phase were,

* To develop iSARAH website
* To gain end-user feedback on the usability, usefulness, ease of use and confidence in using iSARAH
* To rectify usability issues and further refine iSARAH prior to its implementation

This phase involved building iSARAH (Preliminary version) and evaluating its usability, usefulness, and ease of use and user confidence [25, 26]. The usability evaluation protocol was reviewed and approved by the medical sciences Inter-Divisional Research Ethics Committee (IDREC), University of Oxford (Reference number R47560/RE001).

NHS hand therapists (physiotherapists and occupational therapists) who treat people with rheumatoid arthritis and lived within 2 hours of travel to Oxford were considered eligible for participation in the usability testing. Willingness to provide signed consent was the inclusion criterion. Volunteers were invited via the Center for Rehabilitation Research Oxford (RRIO) Twitter page, and the online community forum of the Chartered Society of Physiotherapy (i-CSP).

Based on the available evidence that 80% usability issues can be identified with five participants’ testing and 95% with nine participants [27, 28], we proposed to include ten therapists who fulfil the inclusion criteria.

### Individual appointments to attend usability sessions were coordinated through telephone calls, and the sessions were conducted at the Botnar Research Centre, University of Oxford. Before evaluation, participants provided signed consent and completed a series of demographic questions. The usability testing procedure was then explained emphasising that the session was about evaluating iSARAH and not the user. Each session took approximately 90 minutes. The usability testing involved the following procedures:

1. Think-aloud procedure

The procedure was facilitated by one of the members of the SARAH implementation team. Participants were asked to log on to the iSARAH website by registering with test usernames and passwords. They were then asked to navigate through the website, starting from the homepage. They were simultaneously encouraged to talk about what they felt, saw or thought whilst browsing. The facilitator observed and took notes as participants were asked to verbalise their thoughts. When participants had difficulties in verbalising, they were encouraged by a ‘Keep talking’ signboard and were minimally assisted with prompts (only when required) by the facilitator. All think-aloud sessions were audio-recorded.

1. Self-reported Questionnaires

The Computer System Usability (CSU) questionnaire [29] was used to evaluate user satisfaction, ease of use, information, and interface of the programme on a 7-point Likert scale (1 = ‘Strongly disagree’ to 7 = ‘Strongly agree’).

iSARAH usefulness was measured on a 5-point Likert scale (1- Not at all useful; 2- Slightly useful; 3-Moderately useful; 4-Very useful; and 5-Extremely useful).

Overall ease of use was measured on a 5-point Likert scale (1-Very difficult; 2- Somewhat difficult; 3- Neither difficult nor easy; 4-Somewhat easy; and 5-Very easy).

Confidence in using iSARAH was measured on a 5-point Likert scale (1-Not at all confident; 2-Somewhat confident; 3-Not sure; 4- Confident and 5-Very confident).

1. Interviews

Using a semi-structured interview guide, participants were asked about their experiences in navigating iSARAH. Interviews were conducted for approximately 10-15 minutes and were audio-recorded. User comments’ on iSARAHwere summarised by listening to the audio files and cross-checking the second time.

Results

Phase 1: iSARAH Needs analysis

The SARAH survey invitations were sent to a total of 102 physiotherapists and occupational therapists who downloaded the SARAH programme materials. Figure 1 displays the flow of the survey participants. Table 1 shows the demographic characteristics of those who took part in the SARAH survey.

Table 1: Demographic characteristics of Phase 1 and Phase 3 study participants

|  |  |  |
| --- | --- | --- |
| Demographics | Phase 1  SARAH survey, n=35 | Phase 3  iSARAH usability, n=10 |
| Age groups  21-30 years  30-40 years  40-50 years  >50 years  Gender  Males  Females  Profession  Occupational therapists  Physiotherapists  Employment  Full time  Part time  Work setting  Public (e.g. NHS Hospital)  Private Practice  Other (e.g. Teaching)  Work experience  < 5 years  5-10 years  10-15 years  >15 years  Median (IQR\*):  Hours on internet/day  Median (IQR): | No. of therapists (%)  4 (11.4)  5 (14.3)  16 (45.7)  10 (28.6)  4 (11.4)  31 (88.6)  18 (51.4)  17 (48.6)  18 (51.4)  17 (48.6)  32 (91.4)  1 (2.9)  2 (5.7)  5 (14.3)  14 (40)  3 (8.6)  13 (37.1)  ---  --- | No. of therapists (%)  ----  2 (20)  5 (50)  3 (30)  1 (10)  9 (90)  7 (70)  3 (30)  6 (60)  4 (40)  10 (100)  ---  ---  17 (9.25) years  2 (0.5) hours |

\*IQR: Inter Quartile Range

Table 2 describes the key features of the therapists’ current clinical practice. Most respondents saw more than 10 patients per month with RA

Table 2: Current practices in therapy management of RA affecting the hands, n=35

|  |  |
| --- | --- |
| Survey items | Number of therapists  n (%) |
| Average number of RA patients seen per month  >15  10-15  5-10  Between 1 and 5 | 12 (34.3)  11 (31.4)  3 (8.5)  9 (25.7) |
| Hand outcomes evaluated  Pain  Self-reported hand function  Joint range of motion  Stiffness  Grip and pinch strength  Joint deformities  Performance-based hand function  Disease Activity Score (DAS) 28/Activities of Daily Living | 33 (94.3)  28 (80)  26 (74.3)  26 (74.3)  22 (63)  19 (54.3)  13 (37)  4 (11.4) |
| Types of hand exercises prescribed  Active range of motion  Strength  Tendon gliding  Nerve gliding, Passive or Isometric | 34 (97)  27 (77)  20 (57)  4 (11.4) |
| Other treatments  Self-management/ coping strategies  Joint protection advice  Splinting  Thermotherapy  Therapeutic gloves, Work support and advice on ADL  Electrotherapy | 32 (91.4)  30 (86)  24 (69)  15 (43)  6 (17.1)  2 (6) |
| Methods to encourage exercise adherence  Exercise sheets  Review appointments  Exercise diaries  Exercise contracts  Telephone reminders | 33 (94.3)  29 (83)  8 (22.8)  2 (6)  1 (3) |
| SARAH programme prescribed in practice  Yes  No | 26 (74.3)  9 (25.7) |

Pain, self-reported hand function, joint range of motion, stiffness, grip and pinch strength, and joint deformities were more commonly evaluated as part of their current practice. Performance-based hand function, DAS 28 and activities of daily living (ADL) were the least evaluated outcomes.

The most common type of exercise prescribed by therapists was active range of motion exercises. Strengthening exercises were also frequently used, as were tendon gliding exercises. Nerve gliding, passive, and isometric exercises were much less commonly prescribed.

Self-management strategies, joint protection and splinting were commonly prescribed than thermotherapy, therapeutic gloves, work support, advice on ADL and electrotherapy.

On average, therapists had four sessions with their patients (mean [SD] = 4 [3.9]). The frequency of review sessions was mostly either once every 15 days reported by 11 therapists or every 1-2 months by 9 therapists respectively.

Most therapists used exercise sheets and review appointments to encourage adherence with home exercise programmes. Exercise diaries, exercise contracts and telephone reminders were less commonly used.

Nearly 74% of the therapists delivered the SARAH programme in their clinical practice, and on average had prescribed the programme to 17 (SD = 22) of their patients since downloading the materials. More than 50% of the therapists who delivered the SARAH programme (n=17/26) did not find any aspect of SARAH that made it difficult to put into practice. They reported that the SARAH therapist manual, exercise sheets with photographs, and the strong evidence base facilitated their use of the SARAH programme in their daily practice. Other therapists reported issues with time, funding for exercise equipment, and inability to complete review assessments and exercise contracts.

Therapists who did not use the SARAH programme (n=9) reported a lack of appropriate patients to be prescribed the SARAH programme, budget, time, and their routine prescription of hand exercises like the SARAH programme as main reasons for non-implementation. Barriers and facilitators identified by therapists who completed the survey (n=35) are presented in Table 3.

Table 3: Barriers and facilitators reported by therapists who completed the SARAH survey, N=35

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Barriers/Facilitators | Always a barrier  Therapists n (%) | Sometimes a barrier  Therapists n (%) | Neither a barrier nor a facilitator  Therapists  n (%) | Sometimes a facilitator  Therapists n (%) | Always a facilitator  Therapists n (%) |
| Time | 7 (20) | 16 (45.7) | 11 (31.4) | 1 (2.8) | 0 (0) |
| Forgetting to use | 2 (5.7) | 10 (28.6) | 21 (60) | 0 (0) | 2 (5.7) |
| Belief in its effect on patients | 0 (0) | 0 (0) | 12 (34.3) | 10 (28.6) | 13 (37.1) |
| Influence of peers | 0 (0) | 5 (14.3) | 23 (65.7) | 6 (17.1) | 1 (2.8) |
| The need to change practice | 0 (0) | 5 (14.3) | 14 (40) | 8 (22.8) | 8 (22.8) |
| Instructions to deliver the programme | 0 (0) | 4 (11.4) | 12 (34.3) | 10 (28.6) | 9 (25.7) |
| Current caseload | 1 (2.8) | 6 (17.1) | 9 (25.7) | 9 (25.7) | 10 (28.6) |
| SARAH exercise equipment | 7 (20) | 11 (31.4) | 14 (40) | 1 (2.8) | 2 (5.7) |
| SARAH patient materials | 5 (14.3) | 11 (31.4) | 10 (28.6) | 3 (8.5) | 6 (17.1) |

Therapists were asked what they would like to see in an online training programme if one was available. They suggested it should have:

* A simple web layout and design
* Exercise photographs/videos with clear instructions
* Brief course modules
* A self-assessment section
* Simplified SARAH patient documents
* Instructions on how to complete the personal exercise guide, exercise diary, and Barriers and facilitators form
* Downloadable SARAH programme materials
* Online support for technical queries
* Links for patients to access information or complete outcomes online
* PowerPoint teaching materials
* Compatibility with different browsers e.g. Internet Explorer and Google Chrome, and responsiveness in different devices, e.g. Mobiles and Tablets.

Phase 2: iSARAH Design

Following the multi-disciplinary team meeting, the specific need to educate and train therapists on the behavioural support strategies was identified and a separate course module on this topic was proposed. It was agreed that a section addressing common questions that might be raised by therapists about the SARAH programme in real-world settings should be included in a ‘Frequently asked questions’ section of iSARAH. Attendees provided suggestions for framing these questions. Based on discussions about the iSARAH prototype and SARAH survey findings, the team suggested the following recommendations:

1. To provide web links within the text for additional information on a topic, for example, Splints in RA
2. To provide a progression status bar to allow user to know where they are in the course
3. To use consistent names for exercises
4. To have a separate course video on joint protection advice
5. To have a separate course module on behavioural support strategies
6. To have SARAH exercises demonstrated through videos and photographs
7. To have brief course modules
8. To have a plain layout, and use optimal font sizes (14 points)
9. To have an official email support to address technical enquiries
10. To ensure iSARAH adapts across different types of Internet browsers, and computers at NHS settings and other telecommunication devices.

Specific recommendations were also made regarding the behavioural strategies module:

1. To provide examples for general goals relating to upper limb function to aid therapists with goal setting
2. To include model scenarios on filling the personal exercise guide and Barriers and Facilitators form

To facilitate effective implementation of the SARAH programme by iSARAH-trained therapists in actual practice, ways to minimise major implementation barriers reported in the survey (time limitations, forgetting, and difficulties in access and cost of SARAH exercise equipment and patient materials) were also discussed. Clinicians who had worked on the SARAH clinical trial raised some issues with the original forms used in the trial and they proposed ways to streamline these forms to make them easier to use.

### The following were suggested to guide the implementation evaluation phases of the SARAH programme:

### Making it clear in iSARAH that the SARAH programme is flexible and will be feasible to complete at user convenience

### Sending monthly e-mail reminders to iSARAH trained therapists

### Signposting therapists and their patients to resources needed to deliver the programme which could, ideally, be purchased at a discounted rate (e.g. therapeutic putty, and resistance bands), and

### Providing multiple hard copies of the SARAH patient materials at no cost to iSARAH trained therapists for use in clinical practice, if required.

### Demonstrating high credibility by incorporating information about the SARAH research team and all SARAH peer-reviewed publications

### Proposing pain and self-reported hand function as the main outcomes for the evaluation phase

Phase 3: iSARAH Development and Usability Testing

1. Development - Preliminary iSARAH

iSARAH was built on a Moodle platform (release version 3.1) by the OCTRU IT team, customised and styled using the ‘Essential Theme’ add-on. An overview of iSARAH (Preliminary version) is provided below:

Landing page

The landing page served as an introduction to the iSARAHwith a brief statement about the purpose of the website, site contact information, privacy policy and the modules. Other features included a 2.5-minute preliminary iSARAHpromotional video and a prominent widget for logging on to the course.

Modules

Module 1 covered clinical aspects of RA, benefits of exercises in RA, UK guidelines in the management of RA, and information about the SARAH clinical trial.

Module 2 covered development and physiological principles of the SARAH programme, behavioural support strategies, and instructions on how to deliver the SARAH programme.

Module 3 covered the course assessment

Module 4 included FAQs to inform the delivery of the SARAH programme in different practice settings and patient scenarios.

Resource library

All text materials required to deliver the SARAH programme (e.g. exercise booklets & videos, exercise diary, RA patient education booklets) and additional reference documents e.g. SARAH trial publications were archived in the resource library.

Delivery of content

A combination of text, photographs, tables, and videos was used to deliver the training. Preliminary videos were produced for iSARAH promotion and course instruction purposes.

Visual Design & Navigation

A simple web layout was used consistently across modules to reduce distraction and information overload.

## iSARAH Usability testing

Figure 1 displays the flow of usability testing. Demographics of participants are presented in Table 1.

1. Think-aloud procedure

One of the major usability issues observed was the difficulty in navigating from the end of one module to the next (e.g. from the last page of Module 1 to the first page of Module 2) as there were no direct buttons to take them to the following module. Instead, participants have to click the respective module tabs on the top of the screen navigate between modules or to proceed to the next module. We also noticed that some additional tabs appearing within Moodle platform were confusing for the participants.

Hyperlinks to reference documents such as SARAH trial publications and patient materials were reported to be repetitive and distracting. Participants said that photographs showing RA hands and activities of daily living, and other illustrations did not add to iSARAH but instead occupied screen space and led them to frequent scrolling down to read the whole page. In the course assessment module, when an incorrect response was entered for a question, they couldn’t find a feature to signpost to the correct response in the respective module. They also reported that information about the SARAH team on the homepage was not adequate.

1. Self-reported Questionnaires

Based on the CSU questionnaire, participants overall found iSARAH simple, easy to use, easy to understand, and were satisfied in using it (Table 4). There was an overall agreement that participants could complete their work quickly and efficiently and recover from any unexpected technical mistakes. There was some uncertainty as to whether the system gave error messages and informed them how to fix problems. Results from Likert scales (Table 4) indicated that participants rated iSARAH as useful, easy to use and they were confident about using it.

Table 4: Questionnaire scores of iSARAH usability testing, N=10

|  |  |
| --- | --- |
| CSU Questionnaire items on 1-7 scale\*  \*1-Strongly disagree; 2-Disagree; 3-Somewhat disagree; 4- Neither; 5-Somewhat agree; 6-Agree; 7-Strongly agree | Median (IQR) |
| 1. Overall, I am satisfied with how easy it is to use this system | 6 (0.75) |
| 1. It was simple to use this system | 6 (0) |
| 1. I can effectively complete my work quickly using this system | 5 (1.0) |
| 1. I am able to complete my work quickly using this system | 5 (0) |
| 1. I am to efficiently complete my work using this system | 5 (1.0) |
| 1. I feel comfortable using this system | 6 (1.5) |
| 1. It was easy to learn to use this system | 6 (0.75) |
| 1. I believe I became productive quickly using this system | 6 (1.0) |
| 1. The system gives error messages that clearly tell me how to fix problems | 4(0) |
| 1. Whenever I make a mistake using this system, I recover easily and quickly | 5 (1.0) |
| 1. The information (such as online help, on-screen messages, and other documentation) provided with this system is clear | 6 (1.0) |
| 1. It is easy to find the information I needed | 6 (2.0) |
| 1. The information provided for the system is easy to understand | 6 (1.0) |
| 1. The information is effective in helping me complete the tasks and scenarios | 6 (0.75) |
| 1. The organization of information on the system screens is clear | 5.5 (1.0) |
| 1. The interface of the system is pleasant | 6 (1.0) |
| 1. I like the using the interface of this system | 6 (1.0) |
| 1. This system has all the functions and capabilities I expect it to have | 6 (0.75) |
| 1. Overall, I am satisfied with this system. | 6 (0) |
| Likert scale scores of perceived usefulness, ease of use & confidence in using iSARAH | Median (IQR) |
| Usefulness  (1-Not at all useful; 5-Extremely useful) | 4.0 (1) |
| Ease of use  (1-Very difficult; 5-Very easy) | 4.0 (0) |
| Confidence in using iSARAH  (1-Not at all confident; 5-Very confident) | 4.5 (1) |

1. Interviews

In general, users found that iSARAH was a detailed and helpful learning resource for therapists. The most common comments were that participants liked the web layout, tabs for modules, exercise videos and the whole content. Some key suggestions provided were to create videos of good sound quality and to remove excess text and photographs to keep the information relevant and clear.

1. Modifications made to produce final version of iSARAH

iSARAH was revised to address all major usability issues identified from the think-aloud procedure and interviews (Table 5). Good quality promotional and course instructional videos using media professionals were produced and all irrelevant photographs were removed to allow more screen space. Repetitive links to reference documents and patient materials within modules were minimised. Clear-cut tabs to navigate between the end and start of subsequent modules were set up. The final version of iSARAH was further reviewed for content, navigation issues and grammar by the SARAH implementation team.

Table 5: Major usability issues identified and rectifications made

|  |  |
| --- | --- |
| Usability issues | Solutions implemented in the final iSARAH |
| Difficult to navigate between last and first pages of consecutive modules | Navigation was made easy by adding buttons to take user from the last page of the previous module to the first page of next module |
| Hard to follow different coloured text | Only two colours were used: Black for text and blue for web links |
| Sections A, B, C of Module 2 were confusing | Sections A, B, C of Module 2 were categorised as separate modules- Module 2, 3, & 4 |
| Having FAQs & Assessment labelled as ‘Modules’ is irrelevant | FAQs & Self-assessment were labelled with their same names for more clarity |
| Resource library-Documents are not opening as in a separate window, and was confusing when participants closed the document and wanted to access their last seen page of the course | Documents were set to easily open up and close in a separate window that will allow users stay on their last seen page of the course |
| Too many links within the modules were distracting | Repetitive links were removed |
| Too much scrolling is annoying because of photographs occupying space | Photographs were removed to allow more space for text and less scrolling |
| Self-assessment – When an incorrect answer is entered, participants were not directed to find correct answers in the respective modules | Self-assessment section was set to point out incorrect responses. When the user provides an incorrect response, he/she will be directed to relevant module to learn more on the particular question |
| Homepage does not cover all essential information about the SARAH programme and SARAH team | More information on SARAH programme, the SARAH team and host organisation were added. A promo video was produced. |
| Some Moodle features (e.g. Tags, buttons) were distracting | All irrelevant buttons and tags were removed |
| Quality of videos to be improved | Good quality videos were produced |
| Patient to demonstrate exercises in exercise videos | Exercise videos with a patient volunteer demonstrating the exercises were produced |
| Too much text to read | Text was reduced, more bullet points were used |

Prior to official launch, the following features were tested and activated:

1. Online user registration page
2. Online feedback questionnaire on perceived usefulness, satisfaction and intention to use the SARAH programme in future practice
3. Download option for the course completion certificate

Discussion

### The overall purpose of this paper was to present how we developed an online implementation tool (iSARAH) and produced the final version suitable for implementation. The strength of this work is that it has followed a recognised model for the construction of Web-based programmes [21-24].

Engagement with users through the SARAH survey allowed us to identify current practice and learning needs to ensure iSARAH was fit for purpose. From the survey, we could establish that the exercises included in the SARAH programme were commonly used by therapists [6, 7, 30, 31] but the behavioural change techniques were likely to be less familiar [8-10]. It also gave us insight into potential barriers to implementation. Respondents provided information about the features they would like to see in an online training programme and this has directly informed the design of the programme. Survey findings have also directly influenced the selection of outcomes for the evaluation phase of implementation.

Engagement with users continued during the design phase with a face-to-face meeting as well as carrying out usability testing. Usability testing was essential to producing a user-friendly website that could be deployed for implementation. We believe this has resulted in a flexible learning experience for users, which is easy to navigate with unlimited access. We included FAQs and self-assessment to ensure that therapists have adequate training and skills to efficiently apply for the SARAH programme in actual practice.

The next step is to evaluate the impact of iSARAH training on actual implementation of the SARAH programme including the impact on knowledge and skills of therapists, implementation rates and patient outcomes. We know from our previous work [32] that training alone may not result in implementation [33]. An online training programme developed to facilitate the implementation of a cognitive behaviour approach for low back pain was shown to be as effective as face to face training regarding knowledge and confidence but actual implementation rates were low and further enhancement of the training programme was required [33]. We have tried to identify potential barriers to implementation during the development phase of this project so that these are addressed by the online training.

### This study has some limitations. Firstly, we neither used observational analysis with video recordings in the think-aloud procedure to observe users’ interaction with iSARAH nor conducted a systematic qualitative analysis of participants’ interviews. Secondly, the Computer Usability System questionnaire and Likert scales have not been tested for reliability and validity in the target population. Hence, the range of scores should be interpreted with caution. Thirdly, the SARAH survey participants were familiar with the SARAH programme and hence their responses are prone to the risk of volunteer bias. Additionally, with a low consent rate (39 of 102 participants, 38%), the survey findings are at the risk of non-response bias from people who did not participate or respond. Lastly, we did not employ iterative cycles of usability testing, i.e. consecutive cycles of testing until the point no further usability issues were identified, but we used the feedback from all participants in a one-off cycle to refine iSARAH.

It is indicated that evidence-based therapies are poorly disseminated into routine practice [34]. Some of the barriers often reported by health professionals in practising evidence are the lack of access to evidence resources [35-37], and non-availability of the evidence resources in usable formats [38]. In the context of implementing the evidence-based SARAH programme, we believe that the easy and free access for health professionals to the SARAH programme in a simplified format has overcome these barriers. We foresee that the training of qualified health professionals directly involved in the rehabilitation of people with RA of the hands would increase their knowledge of the evidence (the SARAH programme), and build their skills and confidence to deliver it in practice. The online training would also be a time-saving learning resource that is also potentially flexible in terms of learning [39] for health professionals from diverse backgrounds of internet usage habits and computer skills. Further, the content of the iSARAH can be adapted [19] for language and cultural differences to assist wider implementation. Thus, it would open opportunities to disseminate the SARAH programme among therapists across the world who have limited or no access to the SARAH training.

Next steps

In our next steps toward opening more opportunities for wider uptake and application of the SARAH programme into clinical practice, there is also a huge potential for adapting iSARAH across different cultures and languages across the world.

Conclusions

To our knowledge, iSARAH is the first online learning resource for therapists on an evidence-based hand exercise programme. A systematic design approach by using the ADDIE model and involving end-users has been successful in developing a user-centered iSARAH.

Our ongoing work on the impact evaluation among therapists who completed iSARAH and a service evaluation in people treated by SARAH trained therapists will provide more insights on the uptake of the SARAH programme in actual practice.

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Appendices

Multimedia Appendix 1: iSARAH Screenshots

Multimedia Appendix 2: iSARAH Promotional Video

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Abbreviations

SARAH: Strengthening And Stretching for Rheumatoid Arthritis of the Hand