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Co-creation of a video feedback tool for managing self-care at home in pairs of older adults: a remote experience-based co-design study

Susanna Strandberg, Mirjam Ekstedt, Cecilia Fagerström, Sofia Backåberg

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Susanna Strandberg[1] MSc, RN; Mirjam Ekstedt[1, 2] PhD, RN; Cecilia Fagerström[1, 3] PhD, RN; Sofia Backåberg[1, 4] PhD

[1]Department of Health and Caring Sciences, Linnaeus University, Kalmar/Växjö, Sweden Växjö SE
[2]Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Stockholm, Sweden Stockholm SE
[3]Department of Research, Region Kalmar County, Kalmar, Sweden Kalmar SE
[4]Faculty of Kinesiology, University of Calgary, Calgary, Canada Calgary CA

Corresponding Author:
Susanna Strandberg MSc, RN
Department of Health and Caring Sciences, Linnaeus University, Kalmar/Växjö, Sweden
Universitetsplatsen 1
Växjö
SE

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Abstract

Background: Involving older adults in co-design studies is essential for the development of digital technologies and healthcare solutions to enhance self-care management at home. The use of remote co-design approaches, particularly with a focus on video feedback tools for self-care management, could provide technologically sustainable solutions that address the personal needs of older adults with chronic illness and their companions.

Objective: The aim of this study was three-fold: (1) to identify the factors influencing self-care management among end users, (2) to co-create and refine the design and contents of a video feedback tool, and (3) to test usability together with pairs of older adults at home.

Methods: This study was conducted using an experience-based co-design involving collaboration with older adults, researchers, and service designers. Six workshops, of which five were held remotely and one in-person, were conducted to co-create contents for a video feedback tool with four pairs of older adults. Thereafter, the newly developed self-care exercises underwent usability testing with the pairs of older adults in their homes. Collected data were analyzed inductively through thematic analysis and deductively using the U.S.A.B.I.L.I.T.Y. framework.

Results: The workshop sessions revealed that support and learning within a promoting self-care environment had a positive influence on self-care management for the pairs. The influencing factors and needs were used to co-create two self-care exercises within the video feedback tool: “Breathing exercises” and “Picking up from the floor.” The usability test revealed that the pairs found it difficult to analyze their self-care exercises and indicated a need for a support structure around the video feedback tool.

Conclusions: This study emphasizes that video feedback promotes understanding and facilitates learning by highlighting differences between one's own performance of self-care exercises and that of others. The video feedback tool can be beneficial for pairs of older adults managing self-care at home or as a complement to traditional healthcare services. However, its effectiveness and integration into existing healthcare services need to be assessed through careful design and structured support is still needed.

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Susanna Strandberg[1], MSc, RN, Mirjam Ekstedt[1, 2], PhD, RN, Cecilia Fagerström[1, 3], PhD, RN, Sofia Backåberg[1, 4], PhD

Affiliations

[1] Department of Health and Caring Sciences, Linnaeus University, Kalmar/Växjö, Sweden

[2] Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Stockholm, Sweden

[3] Department of Research, Region Kalmar County, Kalmar, Sweden

[4] Faculty of Kinesiology, University of Calgary, Calgary, Canada

Corresponding author:

Susanna Strandberg, Linnaeus University, Universitetsplatsen 1, 351 95 Växjö, Sweden

email: susanna.strandberg@lnu.se

Authors' contributions

Susanna Strandberg: Conceptualization, Validation, Data collection, Data Curation, Data Analysis, Writing - Original Draft, Visualization Preparation. Mirjam Ekstedt: Conceptualization, Validation, Data Analysis, Writing - Review & Editing, Supervision, Project administration, Funding acquisition. Cecilia Fagerström: Conceptualization, Validation, Data Analysis, Writing - Review & Editing, Supervision, Funding acquisition. Sofia Backåberg: Conceptualization, Validation, Data collection, Data Analysis, Writing - Review & Editing, Supervision, Funding acquisition.

Co-creation of a video feedback tool for managing self-care at home in pairs of older adults: a remote experience-based co-design study

Abstract (450 words)

Background: Involving older adults in co-design studies is essential for the development of digital technologies and healthcare solutions to enhance self-care management at home. The use of remote co-design approaches, particularly with a focus on video feedback tools for self-care management, could provide technologically sustainable solutions that address the personal needs of older adults with chronic illness and their companions. **Objective:** The aim of this study was three-fold: (1) to identify the factors influencing self-care management among end users, (2) to co-create and refine the design and contents of a video feedback tool, and (3) to test usability together with pairs of older adults at home. **Method:** This study was conducted using an experience-based co-design involving collaboration with older adults, researchers, and service designers. Six workshops, of which five were held remotely and one in-person, were conducted to co-create contents for a video feedback tool with four pairs of older adults. Thereafter, the newly developed self-care exercises underwent usability testing with the pairs of older adults in their homes. Collected data were analyzed inductively through thematic analysis and deductively using the U.S.A.B.I.L.I.T.Y. framework. **Result:** The workshop sessions revealed that support and learning within a promoting self-care environment had a positive influence on self-care management for the pairs. The influencing factors and needs were used to co-create two self-care exercises within the video feedback tool: "Breathing exercises" and "Picking up from the floor." The usability test revealed that the pairs found it difficult to analyze their self-care exercises and indicated a need for a support structure around the video feedback tool. **Conclusion:** This study emphasizes that video feedback promotes understanding and facilitates learning by highlighting differences between one's own performance of self-care exercises and that of others. The video feedback tool can be beneficial for pairs of older adults managing self-care at home or as a complement to traditional healthcare services. However, its effectiveness and integration into existing healthcare services need to be assessed through careful design and structured support is still needed.

Keywords: chronic disease; experience-based co-design; eHealth, older adults; self-care; video feedback

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Introduction

eHealth, an evolving field at the intersection of medical informatics, healthcare, and business, actively advances global healthcare through enhanced service delivery and information dissemination via the internet and related technologies [1]. Today, eHealth technologies and remote care are increasingly integrated into the daily practices of healthcare professionals and patients, facilitating self-care management at home [2]. In the context of eHealth, it is crucial to actively involve older adults in co-design processes. Engaging older adults as co-designers ensures that the technologies provide for their specific needs, promote user acceptance, and enhance the usability, accessibility, and effectiveness of eHealth tools [3,4].

As the trend of remote care continues to rise, diverse digital tools are being developed and utilized by older adults at home, presenting both advantages and disadvantages [5-7]. According to Henni et al. [8], digital tools in healthcare services often become inaccessible because they overlook the interaction between the user, their context, and the digital health solution. Therefore, the tools do not effectively support individuals in self-care management or improve their quality of life [8]. There is a particular need for enhancing adaptation of digital tools for older adults with one or more chronic illnesses, to improve healthcare efficiency and provide sufficient support for their self-care needs [9].

Successful self-care management at home is essential for older adults with chronic illness, contributing to well-being and control of chronic illnesses. Self-care involves promoting the ability and motivation to perform self-care exercises consistently over time [10,11]. Collaborative self-care efforts between individuals, particularly when functioning as a pair, have shown notable benefits and mutual encouragement over time [12]. Social support is important for self-care management at home and could support sustainable health and reduce the burden on the healthcare system [13]. Recognizing the crucial role of companions in facilitating self-care for older adults with chronic illness is essential for reducing the burden on the ill adults and enhancing self-care outcomes [14]. Furthermore, the integration of digital tools and using peer support could enhance healthier behavior and confidence in self-care management among older adults with chronic illness [12,15,16]. However, there is a remaining need to deepen the understanding of how older adults can benefit from digital tools to achieve sustainable self-care at home [5].

Involving older adults in co-creation is essential to creating tailored healthcare and self-care support, enabling the development of advanced solutions for effective healthcare delivery [17,18]. Previous studies have demonstrated that digital tools incorporating video feedback and reflection have the potential to enhance motivation and facilitate learning by encouraging reflection and active engagement. This has been seen in the performance of both various sports activities among both adults and children [19-21] and clinical skills among nursing students [22]. Further, video feedback using peer support combined with open inquiry and self-reflection may enhance awareness of individual needs, motivating long-term behavioral changes and illuminating the dynamics of movement variations [22]. In the present study, we intended to engage pairs of older adults in the co-design of a video feedback tool in the context of self-care management at home. The involvement of pairs of older adults was motivated by the potential enhancement of sustainable self-care through social support and the utilization of video feedback based on peer support.

The aim of this study was three-fold: (1) to identify the factors influencing self-care management among end users, (2) to co-create and refine the design and contents of a video feedback tool, and (3) to test usability together with pairs of older adults at home.

Method

Study design

This study adopted a participatory research design approach including three steps of iterative experience-based co-designing (EBCD) [23,24]. The EBCD approach constitutes a methodology capable of formally integrating the experiences of end users into the crafting of services or interventions. Involving end users actively during the initial stages of development enables them to articulate their preferences effectively [23,24]. This study was based on close involvement of three co-design teams: pairs of older adults with chronic illness and their companions, a research team, and a design team. The goal was to identify the needs of end users and develop, refine, and test contents in a video feedback tool in three overlapping, iterative, cyclical steps [23,25]. The “co” in EBCD stands for a partnership to search for new, innovative ways of designing a service or product, where the co-designers have expertise in user experience [26].

The EBCD process in this study consisted of six workshop sessions, development and refinement of new self-care exercises, and usability testing of a video feedback tool using the think-aloud technique [27], see *Figure 1*. The first step was an exploration of end users’ preferences and needs. The second step focused on the contents of a video feedback tool, whereas the third step involved testing of the tool and its contents in the home environment. At the beginning of the fall of 2020, the research team formulated a brief plan and concepts for each of the remote workshops. The strategy and activities underwent iterative refinement in response to what occurred during each workshop, thus permitting an adaptable approach within the digital environment. Establishing a secure, inventive, and permissive environment for all participants engaged in the EBCD process is essential to promoting trust and creativity [28]. This encompasses providing a coherent definition of the project's objectives and clarifying expected outcomes.

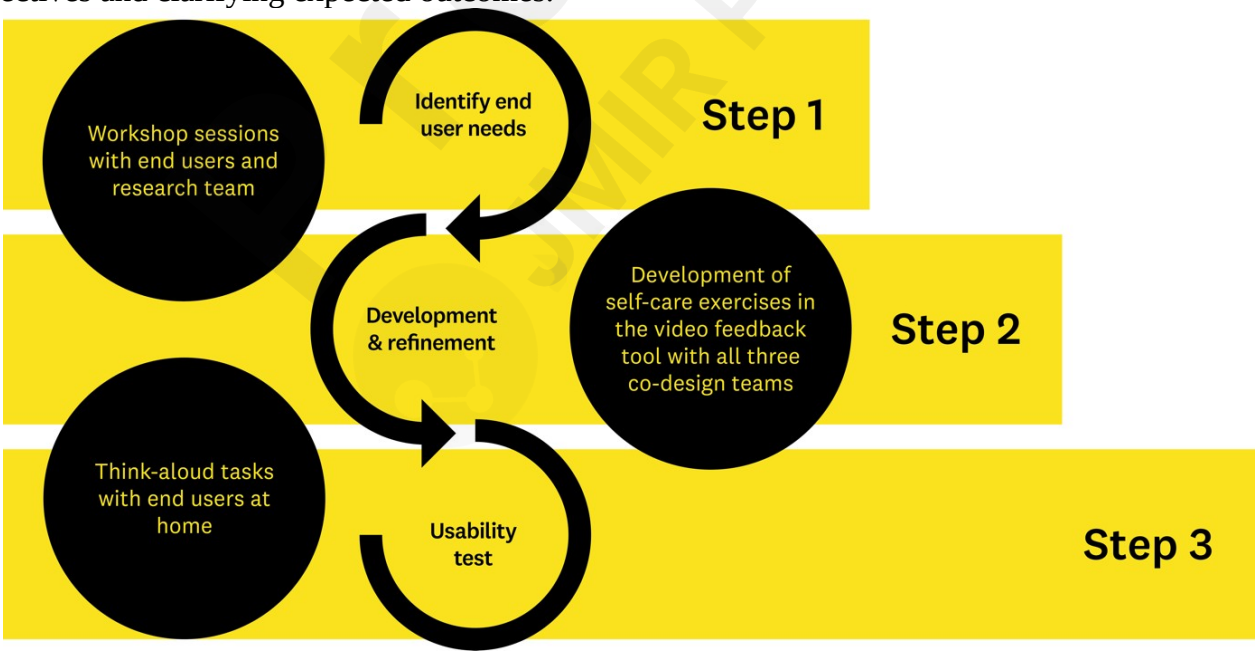

Figure 1. Overview of the three study steps, following the EBCD process throughout the study.

The video feedback tool

For this study, we made use of an existing digital platform called “Move Improve” that facilitates skills acquisition through peer-to-peer learning and video feedback. Move Improve enables users to video record each other, with the overarching goal of mastering skills. Notably, Move Improve provides the capability for content creation also by developers, and it has previously undergone development and testing in various contexts [20,29]. The decision to use Move Improve was based on the possibility of creating self-care exercises in the platform as an interactive and educational instrument by using video feedback and reflection. At the start, the platform encompassed two themes tailored to physical functioning for older adults – “Balance for older adults” and “Daily life movements” – offering a selection of different exercises. Upon selecting an exercise, users received step-by-step instructions for its execution i.e. a list of components, see Fig 2, complemented with a video demonstration. The other person in the pair would record the user while they performed the exercise, facilitating subsequent analysis based on individual components. The analysis involved comparing the user's performance with the exercise instructions, allowing for ratings of “Yes,” “Partial,” or “Not Yet.” This self- and peer assessment resulted in a final score and a written comment provided to the user, see *Figures 2–4*.

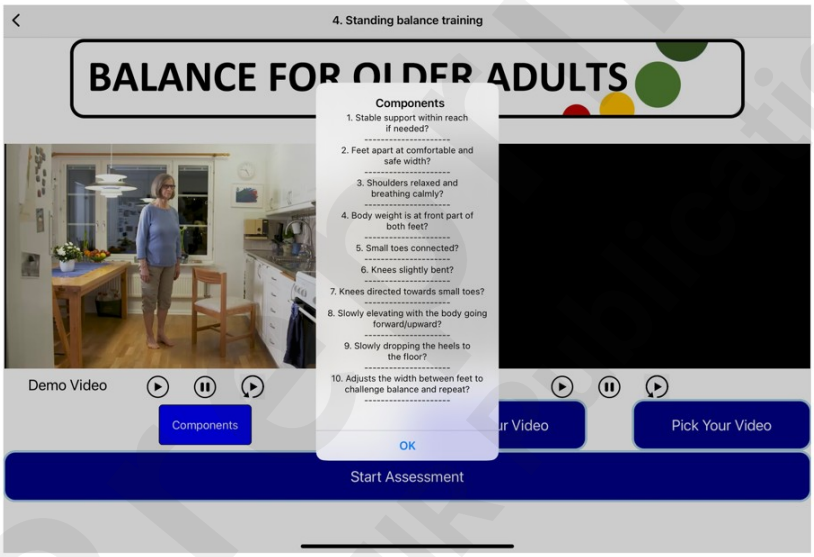

Figure 2. The Move Improve platform, where a balance exercise is shown in a video, and its various components are explained.

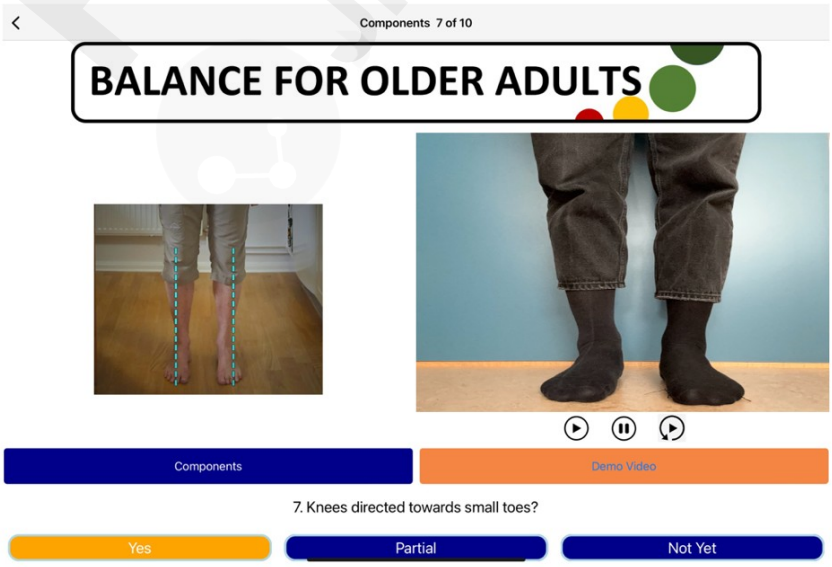

Figure 3. A video-based exercise analysis in Move Improve, involving a comparison between the

original video and the video recorded by the user.

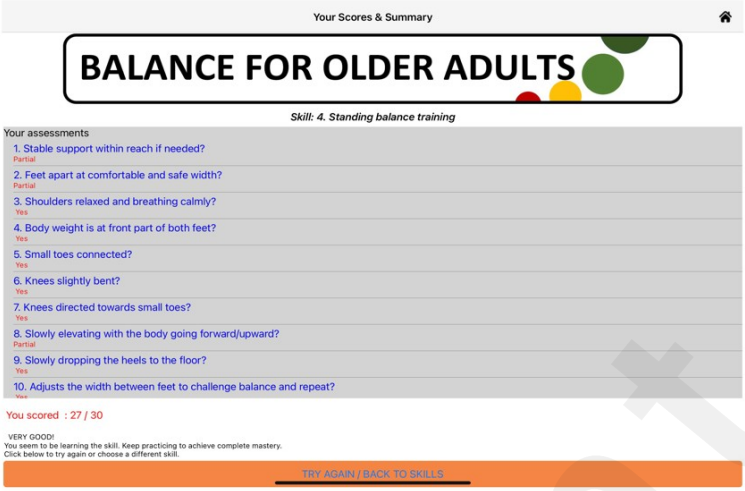

Figure 4. The comprehensive results obtained from an exercise analysis performed in Move Improve.

Participants as co-designers

Three co-design teams were involved in the process: the older adults and their companions in pairs, hereafter called “end users,” the research team, and the design team, see *Table 1*. End users were recruited via telephone by the first author, using purposive sampling. They were taken from a population of individuals with chronic illness participating in a closely related study testing telemonitoring devices in a primary healthcare setting in southern Sweden [12]. This suggests that the individuals in the study often communicated with healthcare professionals in primary healthcare concerning their chronic illness. The inclusion criteria were being to be able to read and speak Swedish, being > 65 years with one or more chronic illnesses, and having internet access. Additionally, participants were encouraged to include a companion, allowing them to form pairs for the present study. The relationship with the companion could vary, but it was essential that they maintained regular contact, and both people in the pair had to reside in a private home, although not necessarily the same home. A total of five persons were asked to participate and invite a companion to the study. One person declined to participate in the study and left no explanation. Therefore, a total of eight older adults chose to participate in the study, forming four pairs.

The research team consisted of nurses and a physiotherapist trained in nursing, behavioral science, and physiotherapy, which means that different disciplines contributed with competence and experience in the development of the self-care exercises. The design team consisted of two service designers who had access to the digital platform and could contribute to the development of its contents and design. The two service designers work with information and communication technology and learning environments, with a focus on digital technology.

Table 1. Demographic information of the co-designers in the three steps.

Co-designers	Age, years (gender)	Relationship	Chronic illness	Study steps
Older adults pair 1	68 (F), 68 (F)	Friends, not living together	Hypertension	1-3
Older adults pair 2	77 (M), 77 (F)	Partners, living together	Heart failure	
Older adults pair 3	78 (M), 77 (F)	Partners, living together	Heart failure	

Older adults pair 4	76 (M), 68 (F)	Partners, living together	Heart failure	
	Professions (n)			
Research team	Registered nurse (n=3) Registered physiotherapist (n=1)			1-3
Design team	Information and communication technology educator (n=1) Educational psychologist (n=1)			1-3

Data collection

Step 1 – the iterative workshops

In the first step, each pair received a customized iPad with the video feedback tool and an application for video conferencing for use during the project period, from March 2021 until March 2022. The video conference software, a communication platform that enables users to connect via video, audio, phone, and chat, was used during the remote workshops. The iPads were delivered to the end users through a strictly planned, in-person delivery process adhering to the COVID-19 guidelines prevailing at the time, including observance of social distancing and hygiene protocols, and the use of recommended protective equipment.

Two researchers from the research team (SS and SB) and four pairs of older adults participated in a series of six workshop sessions. Five workshops were remote, whereas the last one was in-person, see *Figure 5*. The first two workshops started with ice-breaker activities, to promote trust and create a supportive environment. This involved presenting a definition of self-care, encompassing habits like regular eating and consistent sleep, with the end users prompted to reflect on their perspectives. During the next activity, each end user was encouraged to share something that contributed to their personal health and well-being. The video feedback tool was introduced to the end users during the third workshop. Each workshop had a different focus and involved discussion of the end users' needs. The researcher created a live mind map or virtual Post-It notes to engage the end users in discussing and summarizing each workshop. The end users were also assigned a "homework task" for each session. An example of homework was reflecting on the question "How do you support each other engaging in activities through the video feedback tool?", see *Figure 3*. The researchers wrote memos during and after each workshop. After each workshop, the research team (SS, SB, and ME) summarized the discussions among the end users and made a first analysis to identify themes and new questions in order to plan the contents and activities of the subsequent workshop. Backåberg et al. [30] provide a detailed description of the workshop session methods and contents, showing the iterative process.

During the final workshop, which was held in-person, a reflection exercise called "habit analysis" was conducted. The end users were encouraged to rate themselves on a scale based on their health status and autonomy [31]. The habit analysis was conducted to get a more in-depth understanding of the end users' experiences of everyday life, aiming to make their needs visible and enhance the usability of the self-care exercises being co-created. The end users also performed a self-evaluation of their perceived health status. They were asked to place their name on a scale, with less health and more dependence at one end and more health and more independence at the other [31]. The insights gathered from the workshop were integrated with insights from the preceding remote workshops, which underwent additional in-depth discussions during the session. The end users then engaged in activities such as brainstorming, scenario creation, rapid prototyping, and refinement, focusing on a selection of key concepts for development of self-care exercises to include the video feedback tool. All workshops were audio- and video-recorded and simultaneously observed by the researchers, who

wrote memos. The duration of each of the six workshops was 60–240 minutes, with a mean of 125 minutes.

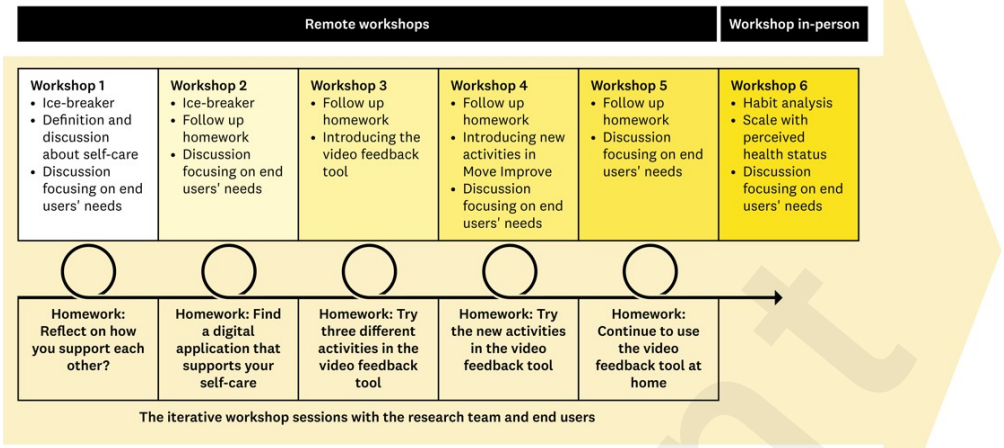

Figure 5. Overview of Step 1, the workshop sessions with the research team and the end users, the activities and contents of each workshop, and the homework assigned between sessions.

Step 2 – Development and refinement

Step 2 involved all three co-design teams in the co-creation of the contents of the video feedback tool based on the end users' experiences shared during workshops. A list of ideas and suggestions for new self-care exercises was created by the end users, based on the research team's Post-It notes and mind maps from the workshop sessions. The research team used the list of ideas to choose topics for discussion, reflection, and planning to develop the contents of two new self-care exercises. The design team participated in recording videos and taking photographs of these new exercises. In this step, the design team made refinements to the Move Improve design based on the feedback received from the end users during the workshop sessions.

Step 3 – Usability testing

Usability tests using think-aloud techniques [27] were conducted during Step 3, to explore the end users' experiences of the design and performance of the new self-care exercises. All usability testing was conducted by two researchers (SS and SB) in the homes of the end users, to deliver an authentic end user experience. The end users were provided with instructions and tasks by the researchers, to collaboratively select and perform a relevant new self-care exercise from the video feedback tool. One person in the pair was instructed to perform the exercise by the other, who recorded this on video. Then, they should switch roles and try another exercise. The end users were encouraged to describe what they were doing and reflect on it while performing the exercise. The researchers emphasized that there were no right or wrong responses or performances. Examples of questions posed during the usability test included: "Could you please explain your choice of this exercise?", "How do you perceive the use of the video feedback tool?", "Would you like to share the potential benefits of this exercise in the future?", "Do you perceive any areas in the video feedback tool that require improvement?", and "How would you describe your overall experience of using the video feedback tool?". All usability tests were video-recorded and observed by a researcher with a structured protocol. The duration of the eight usability tests was 65–95 minutes with a mean of 75 minutes.

Data analysis

All recorded workshops from Step 1, focused on identifying the factors influencing end users as regards self-care management, were professionally transcribed. All the transcribed workshops, and materials such as memos, Post-It notes, and mind maps, were analyzed in accordance with Braun's and Clarke's [32,33] thematic analysis. Thematic analysis is a theoretical reflexive method in which both semantic and latent capture can be used when searching for themes or patterns. The analysis process of thematic analysis can move between inductive and deductive. In this first analysis phase, the data were analyzed through an inductive approach [32]. All data were organized in the NVivo software [34], where the thematic analysis was conducted manually in the suggested step-wise fashion [32,33]. The first author (SS) started reading all transcripts, memos, Post-It notes, and mind maps to get familiarized with all the data and gain a better understanding of the data. The memos and summaries were used in the next phase to generate ideas and start to create codes. In searching for themes among the codes, the authors (SS, SB, CF, and ME) first generated subthemes, which were then further consolidated into themes. All subthemes and themes were reviewed and named, going back and forth to the dataset. All subthemes and themes were discussed among the authors to reach a consensus in the analysis process.

The data collected from Step 3, including the observation protocols and transcriptions of recorded usability tests, were analyzed and coded inductively in accordance with the thematic analysis process. Then, codes were deductively sorted into a coding matrix that was created using the four determinants of the "Use of Technology to Engage in Adaptation by Older Adults and/or Those With Low or Limited Literacy" (U.S.A.B.I.L.I.T.Y.) framework [35]. A deductive approach was used to gain a more in-depth understanding of the challenges of usage of video feedback tool at home [36]. The purpose of the U.S.A.B.I.L.I.T.Y. framework [35] is to assess the prospective usability of health websites among older adults. Here, the framework was used to enhance the understanding of the data collected from the usability tests. The U.S.A.B.I.L.I.T.Y. framework [35] is grounded in nursing theory, technological theory, and behavioral theory relevant to technology utilization and usability in the context of older adults. It encompasses four key determinants: (a) learnability, (b) efficiency, (c) perceived user experience, and (d) perceived control. *Learnability* refers to the end users' reflections on the ease with which they could learn to use the video feedback tool. This includes their experiences of understanding and navigating on the platform. *Efficiency* covers the end users' reflections on how quickly and effectively they were able to accomplish tasks within the video feedback tool. It describes the system's performance in facilitating smooth interactions. *Perceived user experience* describes the end users' subjective experiences of the video feedback tool, capturing their overall impressions, satisfaction, and emotional responses during interactions. *Perceived control* reveals the end users' reflections on their sense of autonomy, confidence, and ability to manage and customize their interactions within the video feedback tool.

Ethics

This study observed the Declaration of Helsinki [36], with all participants getting both verbal and written information about the study design and aim. All participation was voluntary, and the participants could withdraw at any time during the project without giving any explanation. The videos recorded by the end users when using the Move Improve platform at home were deleted and were not used in the study. The study was approved by the Ethical Review Board (DNR: 2020-01219).

Results

Step 1 Identification of the factors influencing end users in self-care management

The factors influencing self-care management among pairs of older adults were sorted into three themes “Overcoming factors influencing self-care,” “Supporting each other in self-care and learning in pairs” and “Promoting a self-care environment,” see *Figure 6*.

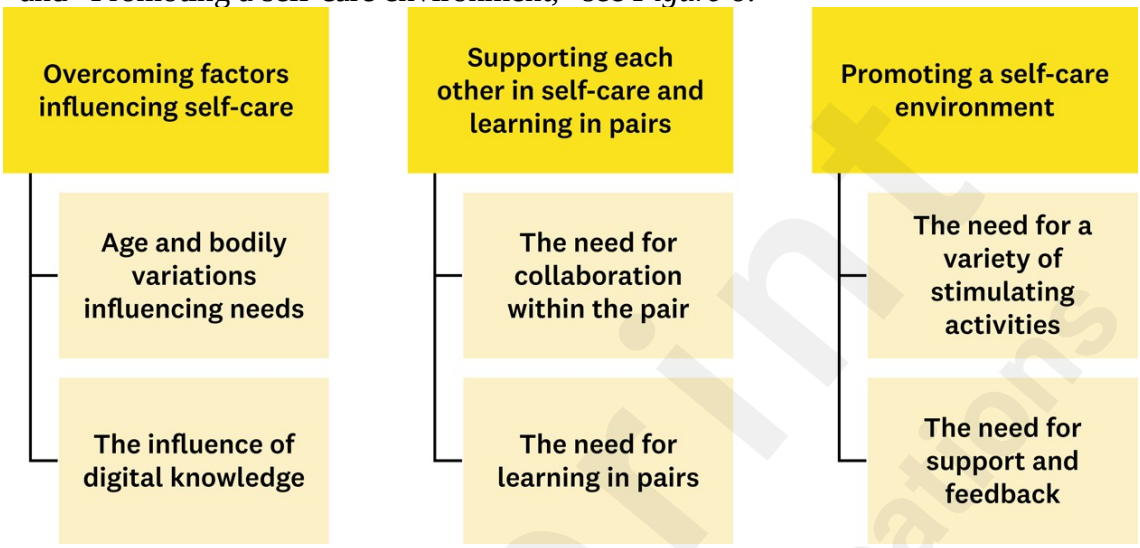

Figure 6. Overview of the three themes and six subthemes of the thematic analysis of factors influencing self-care management among end users when co-creating a video feedback tool.

Overcoming factors influencing self-care

The end users in this study expressed a need to overcome factors influencing their self-care management at home. End users may encounter diverse challenges to engaging in self-care, including factors such as **age and bodily variations that influence their needs**. The challenges of self-care activities varied with age and bodily variations, necessitating the recognition and acceptance of limitations. During the workshops, the end users mentioned a decline in balance with age, emphasizing a need for proactive balance training. They also mentioned challenges to retrieving items from the floor due to physical impairments and declining balance, hindering their daily lives. The end users described the importance of relaxation, with suggestions of support for breathing exercises emerging during workshops.

> *I’m just thinking out loud here, but that maybe you start from different needs too, and I mean maybe someone has an injury and has really poor balance and then balance exercises would be great.* **End user no 5**

The end users highlighted another challenge in managing self-care at home: **the influence of digital knowledge**. Differing levels of familiarity with digital tools were identified among the end users, ranging from daily use of a smartphone to basic use of mobile phones, primarily for calls. The end users expressed concerns about potential distractions of technology and underlined the challenge of keeping pace with rapid technological advances. Barriers, such as the unreliability of digital tools, including inaccuracies and issues with mobile phones, could lead to difficulties in utilization, reduced engagement, and a resurgence of previous health issues and symptoms. On the other hand, the end users also expressed an interest in using digital tools to monitor health parameters and self-

care activities and thereby improve self-care management. For example, monitoring of step counts and of oxygen levels was recognized has having the potential to increase engagement in self-care. However, the end users' experiences underscored the necessity of better integration of digital tools into daily routines and customizing them based on personal preferences.

Supporting each other in self-care and learning in pairs

During the workshops, the end users stated that supporting and learning from each other was a factor influencing self-care management at home. They explained that there was a **need for collaboration within the pair**, which they thought could be a valuable resource for enhancing self-care management. They also described how they could develop habits to complement each other within a pair over time, based on each person's unique qualities. This created shared patterns and a degree of flexibility, promoting an environment that valued individual differences and built mutual support within the pair. The end users described a motivating sense of synergy that arose through the mutual support, the shared experiences, and the collaborative activities. This contributed to a sense of enjoyment and underlined the importance of a shared daily routine. Also, they said that they reminded each other of mutual goals to enhance each other's motivation when performing different self-care activities at home.

> *Yeah, but it's good if you're two friends, like you are, E1 and E2. For me ... "Do you want to go for a walk", "We have to do this now", that's like the whip. Because then you can't let them down either, when you've decided "We're going to do this now".* **End user no 6**

The end users described **a need for learning in pairs**, which could increase the motivation or commitment to perform self-care exercises at home. During their use of the structured video feedback at home, the end users noticed variations in their individual movement patterns, prompting self-reflection on their movements and the self-care exercises. They observed significant differences between their own videos and the demonstration video, underscoring the need for additional practice, particularly in areas such as balance training. The end users highlighted the use of the video feedback tool as an enjoyable shared activity, fostering mutual encouragement in self-care exercises, including mutual learning, and seeking support from one another when facing challenges.

Promoting a self-care environment

The end users stated that promoting a self-care environment at home involved recognizing and addressing specific needs. They emphasized **the need for a variety of stimulating activities** to maintain engagement and motivation in self-care management. According to the end users, a diverse range of stimulating activities was important to help counteract boredom and promote a sustainable practice of self-care when using a video feedback tool. They also recognized the importance of adaptability in the activities, to ensure comfortable performance, and underlined the need for making adjustments based on day-to-day status and specific needs. The end users also stated that the self-care exercises in digital tools needed to contribute to health improvements to ensure use in everyday life.

> *Yeah, I read beforehand what was included. Balance was one main thing and that's something that I do struggle with. I use a walker, so I want something that I feel that I can ... that it works, so I feel satisfied in that I am able to do these things.* ***End user no 1***

Additionally, the end users highlighted **the need for support and feedback**, viewing it as a factor enhancing their self-care management. The feedback on self-care exercises when using a video feedback tool as a pair at home could contribute to encouragement and serve as an external reminder. The end users described a need for support in analyzing strengths and weaknesses when using the video feedback tool, to enhance their understanding of their performance. They thought that adding consistent feedback and follow-up from healthcare professionals would contribute to effective supervision, with clearly defined goals being essential when managing self-care at home.

Step 2 Developing and refining content in the video feedback tool

The workshops facilitated the co-creation of new self-care exercises through iterative discussions between the end users and the researchers. The research team decided to develop two new self-care exercises in close collaboration with the design team and the end users, as illustrated in *Figure 7*. These self-care exercises were "Breathing exercises" and "Picking up from the floor," depicted in *Figures 8–11*. The exercise "Picking up from the floor" refers to picking up objects from the floor in a gentle manner.

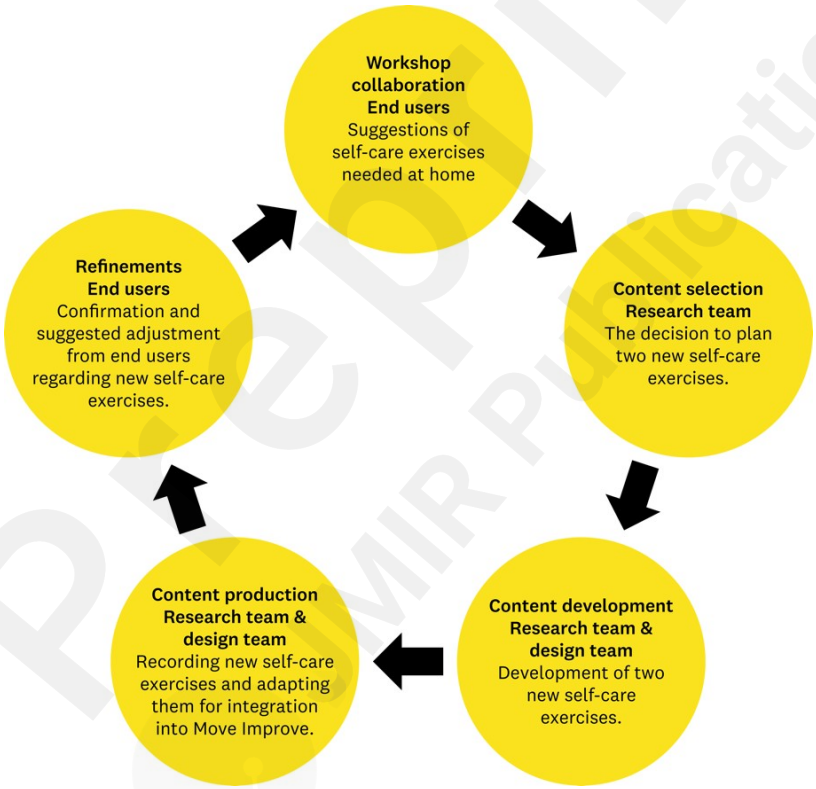

Figure 7. The iterative co-creation process involving all three co-design teams, developing and refining two new self-care exercises in the video feedback tool.

The development and refinement of these exercises aimed to introduce a dynamic and adaptable approach tailored for use by older adults at home. The decision was also made to include audio files in the guide on "Breathing exercises" and text instructions in the video for "Pick up from the floor," to accommodate hearing or visual impairments. Manuscripts and instructions for the two self-care exercises were created through discussions within the research team and included components specific to each exercise. The research team and the design team created and recorded videos and took photographs for the new self-care exercises together with a hired actor. Adjustments and refinements were made by the design team based on end user needs, such as ensuring that instruction videos would not start playing automatically, clarifying instructional images for the different steps,

and providing translations from English into Swedish. Then, the two new self-care exercises were ready for use and testing by the end users at home.

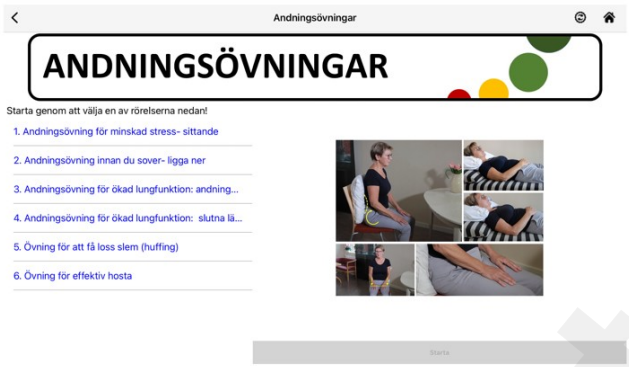

Figure 8. The different exercises in the theme “Breathing exercises” in the Move Improve platform.

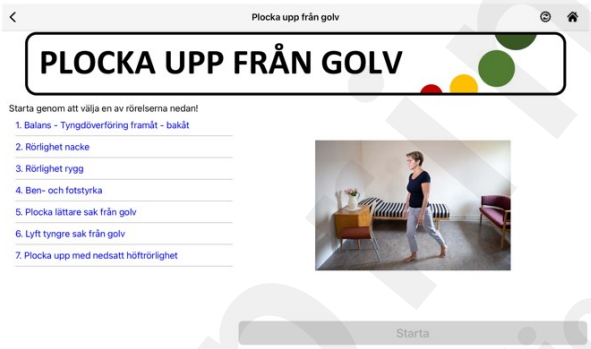

Figure 9. The exercise “Leg and foot strength” in the theme “Pick up from the floor” in the Move Improve platform.

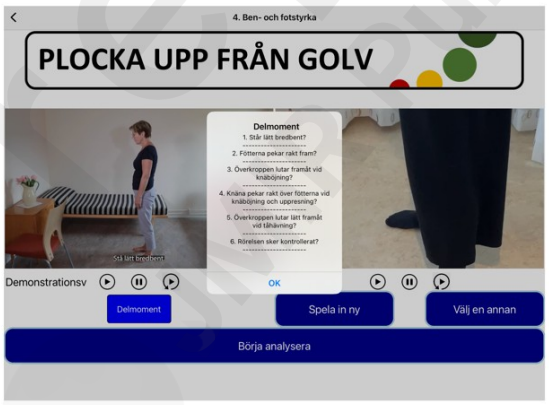

Figure 10. Example of text instruction in the demonstration video can be seen together with the components of the exercise “Leg and foot strength” in the theme “Pick up from the floor.”

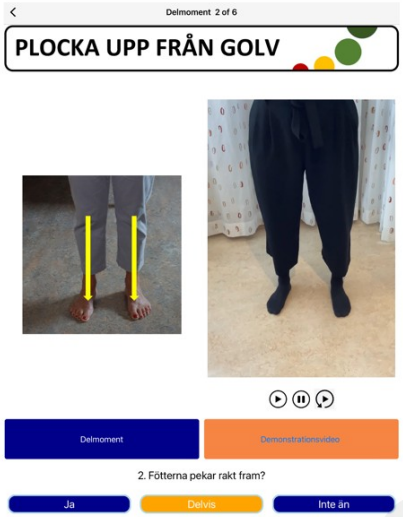

Figure 11. Example of the analysis process with new images supporting end users in evaluating their performance of an exercise.

Step 3 Testing the usability of the video feedback tool

Most end users were able to use the video feedback tool, as indicated by the task observation, see *Table 2*. However, some challenges were observed in the recording of self-care exercises. According to the observation, 3 out of 4 participants completed task number three, which involved recording a video while performing a self-care exercise. One pair of end users needed guidance and hands-on support from the research team to start the recording of the self-care exercise in the video feedback tool during the usability test. The end users often felt uncertain in using the video feedback tool to record exercises performed by their companion, leading to dialogues within end user pairs to collaboratively resolve these issues.

Some reflections from the research team during the usability test related to language comprehension challenges that arose when the end users encountered error messages in English. The use of the video feedback tool fostered a dialogue within end user pairs, where the end users motivated each other through positive comments or engaged in a friendly competition to achieve the best scores for completed exercises. The end users tended to be less critical of each other and adopted a supportive approach when jointly reviewing the recorded exercise analysis. Some end user pairs performed the analyses of the video recordings together, whereas others completed the analyses individually.

Table 2. The task completion rate during the usability tests in Step 3, the end users' suggestions for improvements, and the research team's reflection.

Task	Completed task rate	End users' suggestions for improvements	Research team reflections
1. Start the video feedback tool and choose a self-care exercise	4 of 4 pairs	Larger text and better contrast for visibility. Clear instructions on which exercises are beneficial for specific purposes. Use together with healthcare professionals to enhance performance and pick correct exercises.	Discussion within the pair about the need for a specific exercise. Difficulties in finding suitable exercises.
2. Prepare reading instructions and watch instruction video	4 of 4 pairs	Hard to understand the instructions, which were described as difficult. Automatic playback of instructional video. Instruction text not visible in the video in portrait mode.	Optimal directions for video recording to capture the exercise performed. Generating interest in doing more self-care exercises.
3. Record the	3 of 4 pairs	Need for instruction during the recording of the	Challenging to fully adapt their movement patterns based on the

self-care exercise with video		exercise. A stand for the iPad, to achieve more stable recording during activity execution.	demonstration video. Difficult to record at home due to difficulty zooming out sufficiently. End users' fingers partially obstructed the camera, resulting in incomplete video coverage, complicating analysis.
4. Conduct analysis by comparing videos	4of 4 pairs	Automatic playback of instructional video during analysis.	Struggled to compare their video with the instructional video, which sometimes led to inaccuracies in their analysis responses. End users encountered difficulties in finding their recorded video when beginning the analysis. Easier to use independently on the second attempt.

During the usability test, the end users provided reflections and insights about their experiences of the video feedback tool, presented in *Table 3*. There is a contradiction in that the end users stated that they found it easy to choose exercises, whereas the researchers perceived that they had difficulties with this. The same is true for the self-care exercises and their purposes; the end users found it challenging to understand the purpose and reason for analyzing exercises, even though the analyses clarified movement differences and training needs. During the entire iterative EBCD process, from Step 1 to Step 3, minor adjustments and refinements were made in the video feedback tool. One enhancement suggested was related to zoom functionality on the iPad and another was facilitating access to components during analysis.

A summary of adjustments and improvements that were implemented into the platform functionality:

- End users need to be able to manually start playback of the video, both generally and specifically during analysis.
- Instructions should be visible in portrait mode.
- Minor technological errors (bugs) were corrected.

Table 3. Summary of usability findings for co-created self-care exercises, sorted into the coding matrix applying the determinants of the U.S.A.B.I.L.I.T.Y. framework.

Element	End users' reflections
Learnability	Struggled with navigating back within the video feedback tool and returning to the main menu. The demonstration video for the exercise, along with the accompanying images, was considered to clearly illustrate how the exercise should be carried out. The end users liked a combination of text and audio instructions for the exercises.
Efficiency	Confidence in choosing exercise. iPad was heavy and unwieldy during use. It was considered difficult to zoom out sufficiently in recording a video, making it challenging to capture the entire activity when space was a constraint.
Perceived user experience	A need for a digital stylus to enhance precision when interacting with the platform. Challenging to grasp the purpose of the analysis of the recorded exercise. Usage involved joint planning and some practicing of the exercise within the pair. Clarified movement patterns and how to improve them.
Perceived control	Uncertainty among the end users on whether they were executing the exercise correctly or understanding it accurately. Instructions for exercise components were unclear (for example, the meaning of "slightly bow-legged" was unclear to the end users). Performing exercises at home eliminated the need to change for gym or healthcare visits.

Discussion

The process of co-creation of self-care exercises to include in the video feedback tool involved tailoring the exercises to the preferences and needs of the end users through the EBCD process. This approach is recommended to enhance overall ease of utilization within a home setting [24]. The first of the three main findings of this study is that end users play a crucial role in promoting and facilitating improved self-care management among older adult pairs through the use of video feedback. This can

be achieved through addressing barriers, fostering support and collaboration, and promoting an environment conducive to self-care. Second, there was a discrepancy between the end users and the research team regarding their experiences of choosing self-care exercises in the video feedback tool and understanding their purpose. Lastly, this study showed that it was possible to engage end users as co-creators, whether remotely or in-person, for the development of self-care exercises that can be used with video feedback in collaboration with a companion in the comfort of home.

The U.S.A.B.I.L.I.T.Y. framework was used to enhance our understanding of the data collected [35]. Ensuring a strong fit between end users and a digital tool is crucial for prospective usability, especially among older adults. The *perceived user experience* was essential for assessing how well the video feedback tool aligned with the needs of the end users. The study revealed that the end users understood the variations in their mobility patterns. Additionally, they were seen to provide mutual support during the performance of self-care exercises. This potential for a sense of belonging and collaborative engagement in self-care activities holds promise for enhancing the overall user experience and for future adoption of this tool.

This study also identified factors influencing self-care management, such as aging and chronic illness, which can alter physical functionality. If such factors compromise end users' perceived autonomy, confidence, and ability to use a digital tool, they may prevent use of that tool. *Perceived control* as described in the U.S.A.B.I.L.I.T.Y. framework is essential for sustained motivation and use [35]. These findings further underscore the importance of creating digital tools that address the fundamental needs for sustained motivation [37], in conjunction with the development of self-care exercises that can promote necessary changes. Co-creating exercises that can motivate older adults to maintain their self-care skills can be the difference between living an independent life and relying on others to live at home [38]. The findings are supported by those of other studies, which suggest that digital tools should be customized to align with older adults' daily routines and home environments, to enhance sustainability and long-term usability [5,39].

Comparing the results with the U.S.A.B.I.L.I.T.Y. framework revealed that co-creating digital content with older adults had a positive impact on *learnability*. This was supported by the end users' meaningful contributions in refining the content, particularly through suggestions for text and audio instructions related to the two new self-care exercises. Learnability also encompasses the end users' assessments of how easily they could understand the functionalities of the video feedback tool and their experiences of navigating on the platform. Hillis et al. [20] showed that peer-to-peer learning through video feedback can facilitate learning and skills acquisition in various physical exercises. However, the results of the current study highlighted a potential risk that a person in a pair could be overly lenient in the analysis of a self-care exercise – this would hinder the learning process for the other.

The video feedback tool in the current study was tailored to the needs and preferences of older adults regarding the management of self-care activities at home. Papoutsi et al. [40] emphasized the importance of co-creation of digital tools within the specific context where the technology is intended to be used, ensuring better integration into both patient self-care and healthcare services. Henni et al. [41] have shown that co-design promotes the ability to tailor digital tools to individual needs and challenges, which is crucial in achieving equitable healthcare services. Taylor et al. [39] emphasized that tailoring has the potential to enhance the inclusion of end users when co-creating digital tools. Further, Taylor et al. [8] highlighted that older adults and their partners need to be the focus of attention, to reduce the burden of self-care for collaborating pairs. However, in the current study, the end users themselves believed that support from healthcare professionals was needed in selecting self-care exercises and receiving feedback on the exercises performed. The use of this video

feedback tool in collaboration with healthcare professionals was not investigated in this study and further studies are needed to enhance integration within healthcare services.

This study underlined the challenges faced by the end users in understanding the purpose of self-care exercises in the video feedback tool. This revealed a need for further development and refinements to enhance the efficiency of the tool. The *efficiency* determinant in the U.S.A.B.I.L.I.T.Y. framework refers to a system's ability to enable seamless interactions. The current study demonstrated the benefits of using the video feedback tool in pairs, for example by creating a discussion between the end users on which self-care exercises were most appropriate to carry out based on their needs. The mutual support within the pairs enhanced the efficiency in completing tasks using the video feedback tool. Navarro et al. [42] suggested that video is an effective method for older adults with chronic illness to learn self-care. This finding provides hope for the further implementation of the current video feedback tool in healthcare services.

In accordance with a review by Fischer et al. [41], the involvement of older adults was found to be essential in the initial stages of this study, especially for the understanding of users' needs and for conducting usability tests. The challenges of involving older adults in the development phase warrant further exploration. Fischer et al. [41] emphasized that even if end users are included, this does not necessarily lead to improved adoption of new digital tools within healthcare organizations. Despite the potential efficiency of digital tools for managing chronic illness among older adults, some challenges persist, including concerns related to everyday use [39]. This underscores the importance of factors beyond user involvement – such as engaged healthcare professionals – for effectively utilizing digital tools and ensuring successful implementation.

Strengths and limitations

This study was strengthened by involving end users in all three steps of the iterative process. Inclusion of the experiences and knowledge of older adults, and the collective insights of the research and design teams, with diverse backgrounds and from different disciplines, in accordance with the EBCD process [23], strengthened the study's results. This study emphasized the importance of involving older adults early on and engaging them throughout the entire process of co-creating digital tools, in line with the Medical Research Council's framework for complex interventions [43]. Another strength of the study lies in the involvement of multiple researchers analyzing diverse data types, encompassing interview materials from workshops and interviews, and observations from usability tests. This strengthened the study's trustworthiness.

A limitation of this study arises from the small sample size, which may not accurately represent all older adults. To mitigate this, we tried to include a variety of older adults with diverse chronic illnesses and needs, see *Table 1* for demographics. It is crucial to involve older adults facing different barriers, such as impairments due to chronic illness, in the research process when developing digital tools [8].

Due to COVID-19 restrictions in Sweden, data collection for this study was primarily performed through remote workshops, excluding older adults without internet access, and posing challenges in the case of unreliable internet connections. Limitations arise from the fact that verbal communications and body language were not fully observed during digital data collection. In one remote workshop, technical limitations prevented active participation for one pair of older adults, although the focus of that session was primarily on introducing the video feedback tool rather than discussion among participants. On the other hand, a notable strength of this study lies in the

utilization of remote data collection facilitated by a digital conference system. Darley et al. [3] have also underscored the advantages of remote data collection in co-design studies involving older adults, as this allows the participation of individuals with limited travel possibilities and a range of differing lifestyles.

Conclusion

Given the growing demand for healthcare services, the video feedback tool holds the potential to serve as a valuable contribution that could increase patient engagement in self-care management. This study has demonstrated that the possibility of involving end users as co-creators in developing self-care exercises, whether remotely or in-person. Such self-care exercises can then be utilized alongside video feedback, enabling older adults to engage with a companion and enhance their self-care management at home. However, the findings of the study also highlight the need for older adults to receive support and feedback regarding self-care and the utilization of a video feedback tool. Therefore, there is still a need for further exploration of whether and how healthcare professionals can integrate video feedback into their interactions with patients with chronic illness and their companions. Future studies should explore how video feedback can be applied in the healthcare settings and how it can be adapted and tailored to care among older adults with chronic illness. It is essential to understand how healthcare professionals and older adults can effectively collaborate to enhance self-care management at home using video feedback for self-care exercises. Additionally, attention should be directed at facilitating the implementation of video feedback tools with the potential to ease some of the burden on healthcare services.

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Data availability

The data that were collected and analyzed in this manuscript are not publicly available due to participants not having consented to public availability. Aggregated data in Swedish are available from the corresponding author on reasonable request.

Conflicts of interest

The digital platform Move Improve originated from research conducted at the University of Calgary under the supervision of Dr. Larry Katz. Currently, it is under the ownership and distribution of Savvy Knowledge Corporation. The authors of this paper collaborated with researchers from the University of Calgary and Savvy Knowledge Corporation in the development of content in Move Improve.

Abbreviations

E1: End user number one
E2: End user number two
EBCD: Experience-based co-designing
U.S.A.B.I.L.I.T.Y.: Use of Technology to Engage in Adaptation by Older Adults and/or Those With Low or Limited Literacy

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Supplementary Files

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Figures

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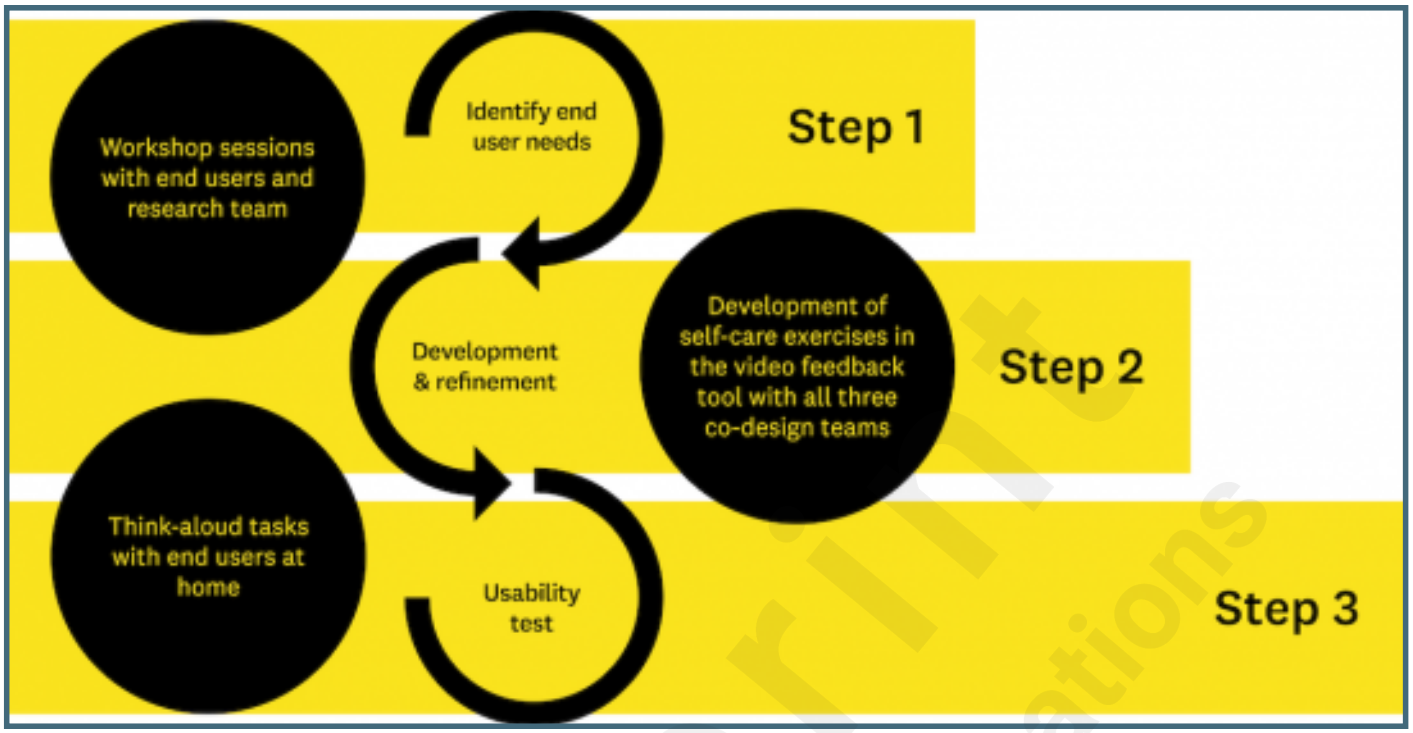
Overview of the three study steps, following the EBCD process throughout the study.



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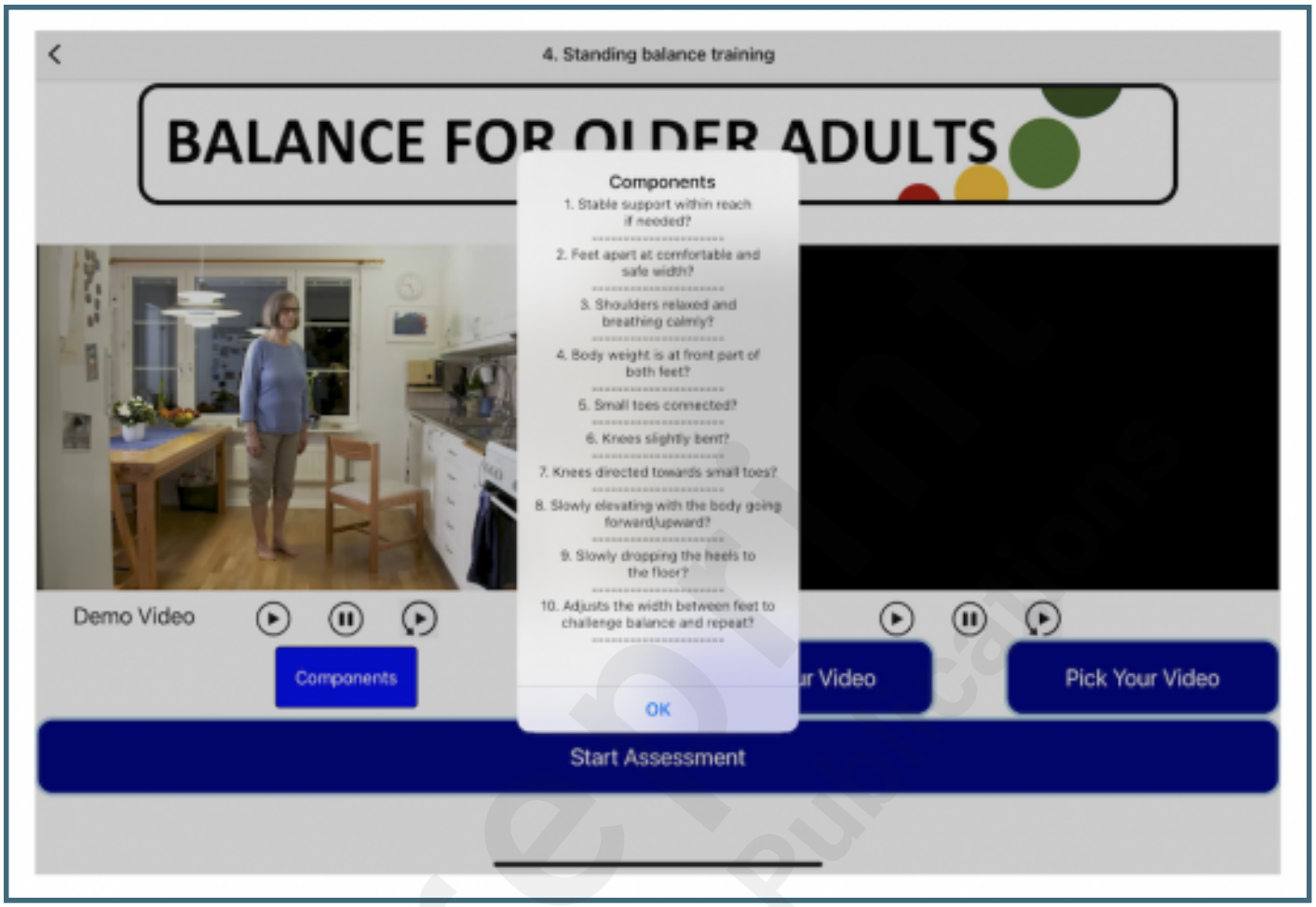
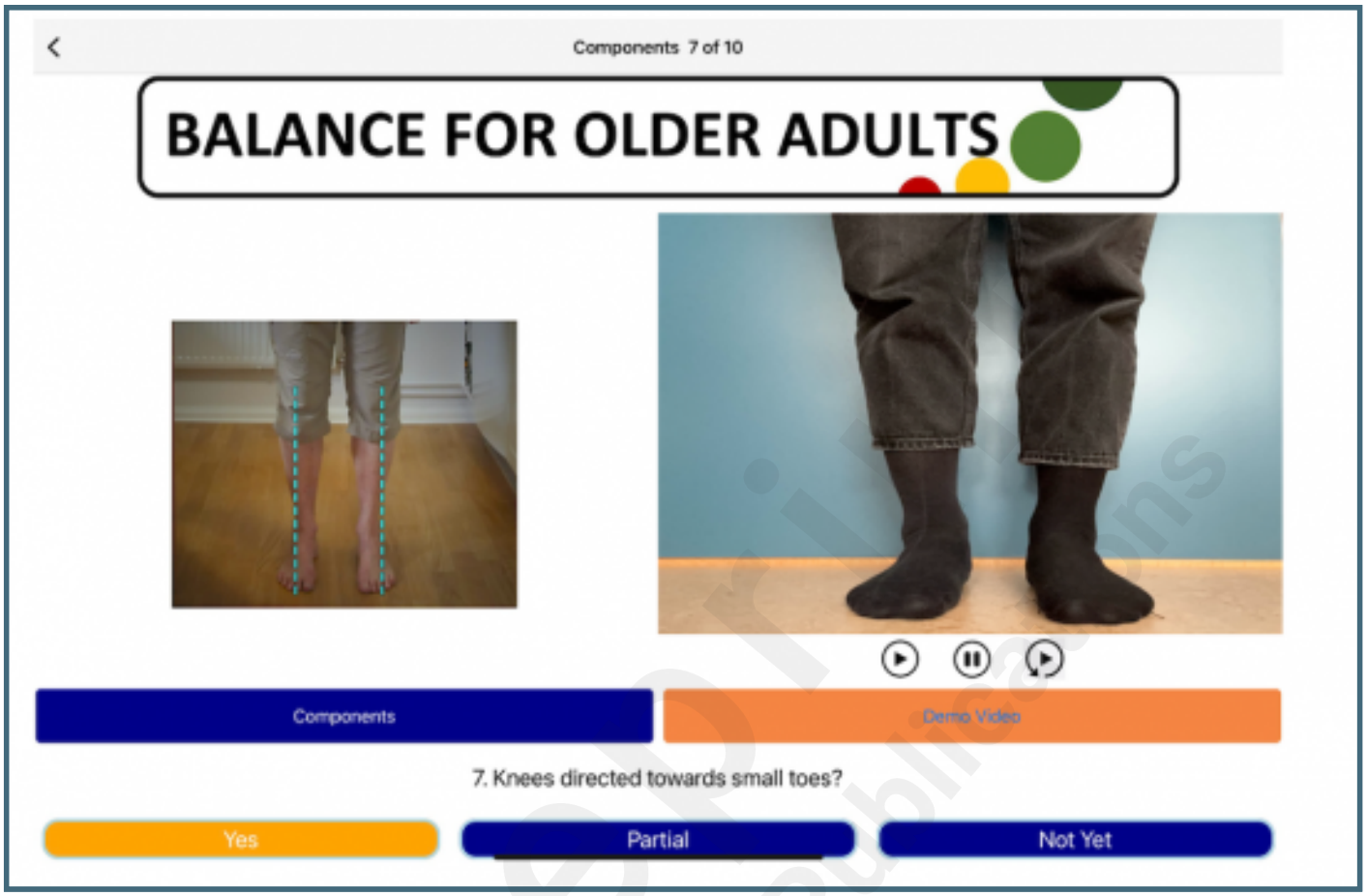
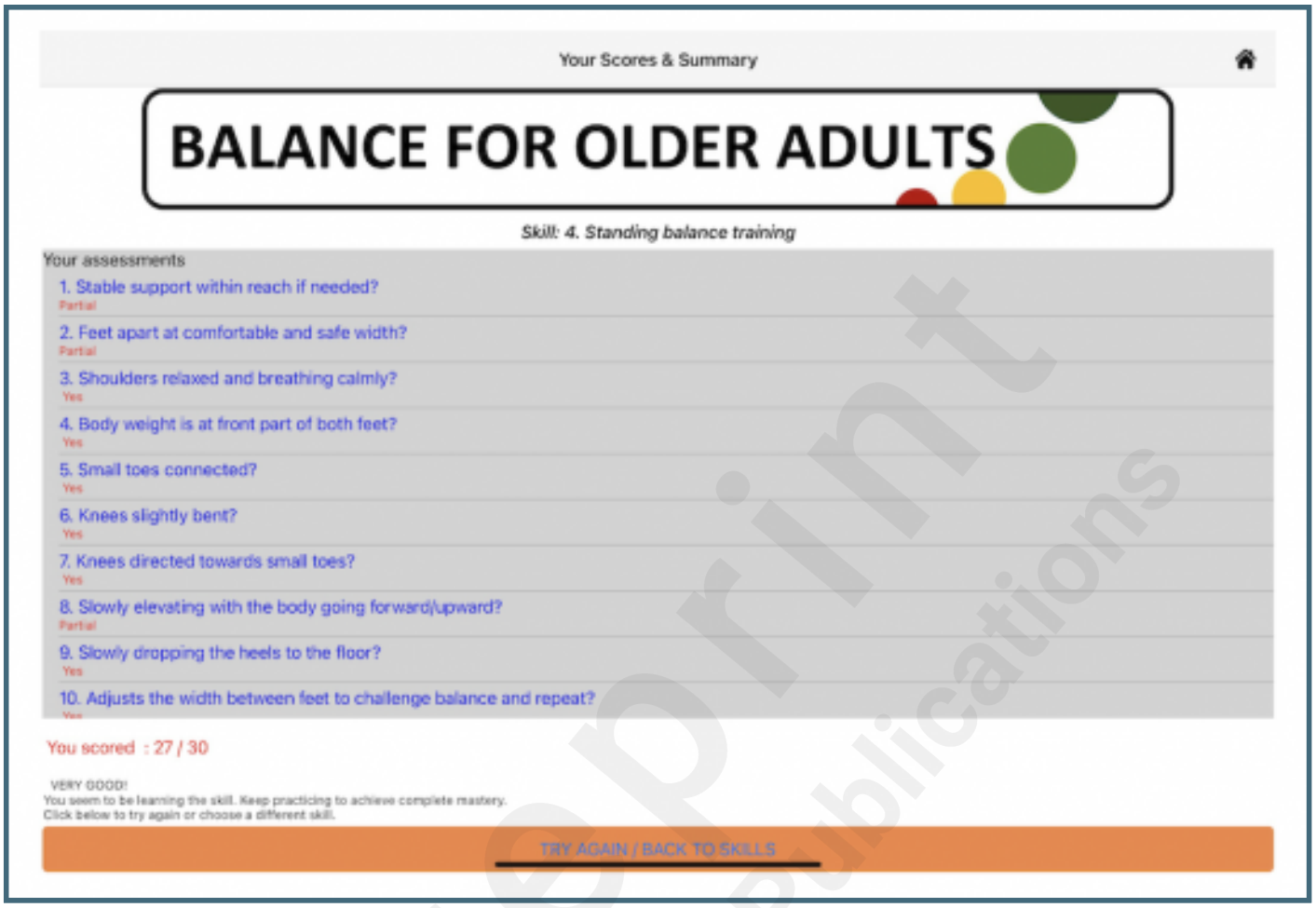
The Move Improve platform, where a balance exercise is shown in a video, and its various components are explained.



A video-based exercise analysis in Move Improve, involving a comparison between the original video and the video recorded by the user.



The comprehensive results obtained from an exercise analysis performed in Move Improve.



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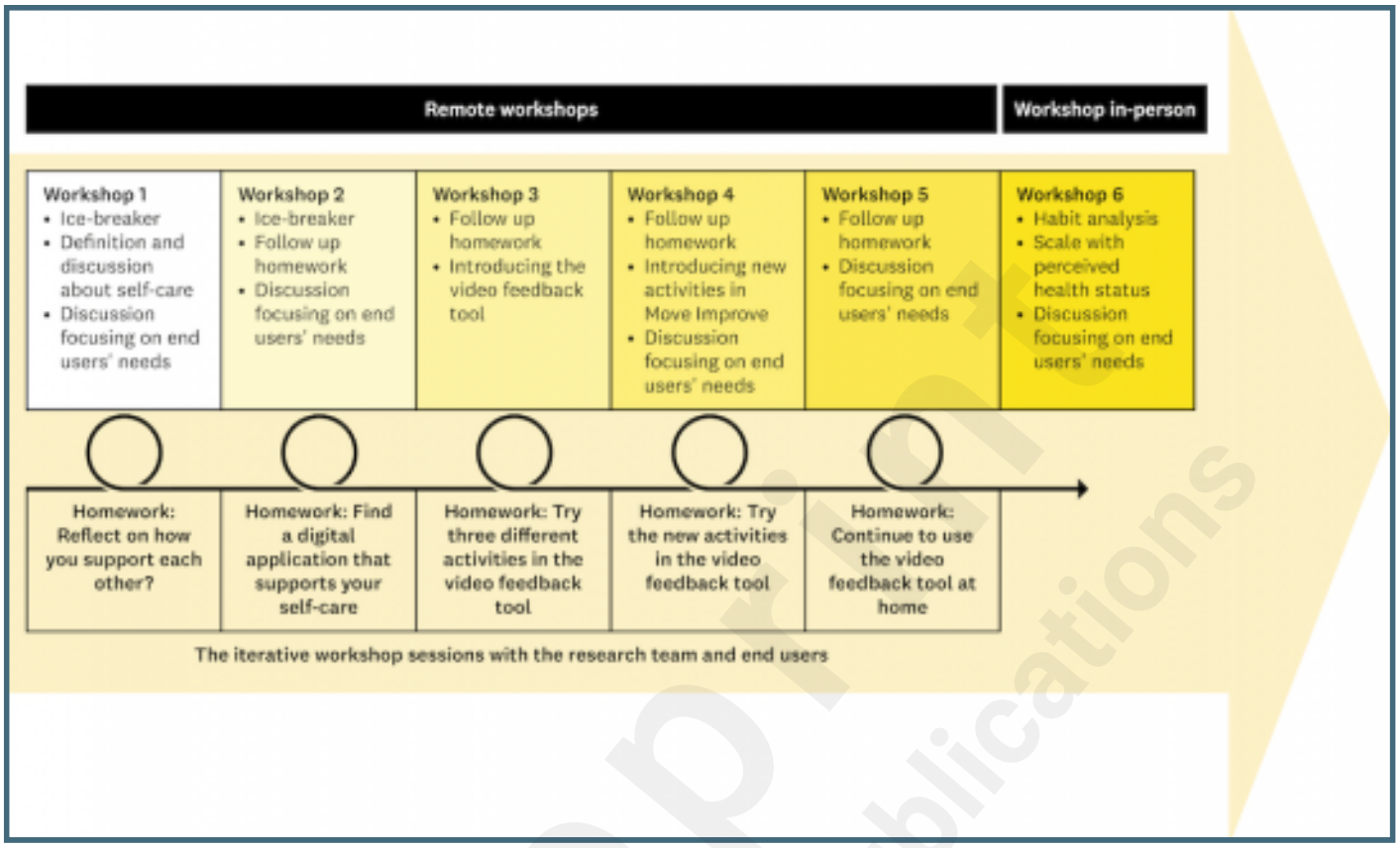
Overview of Step 1, the workshop sessions with the research team and the end users, the activities and contents of each workshop, and the homework assigned between sessions.



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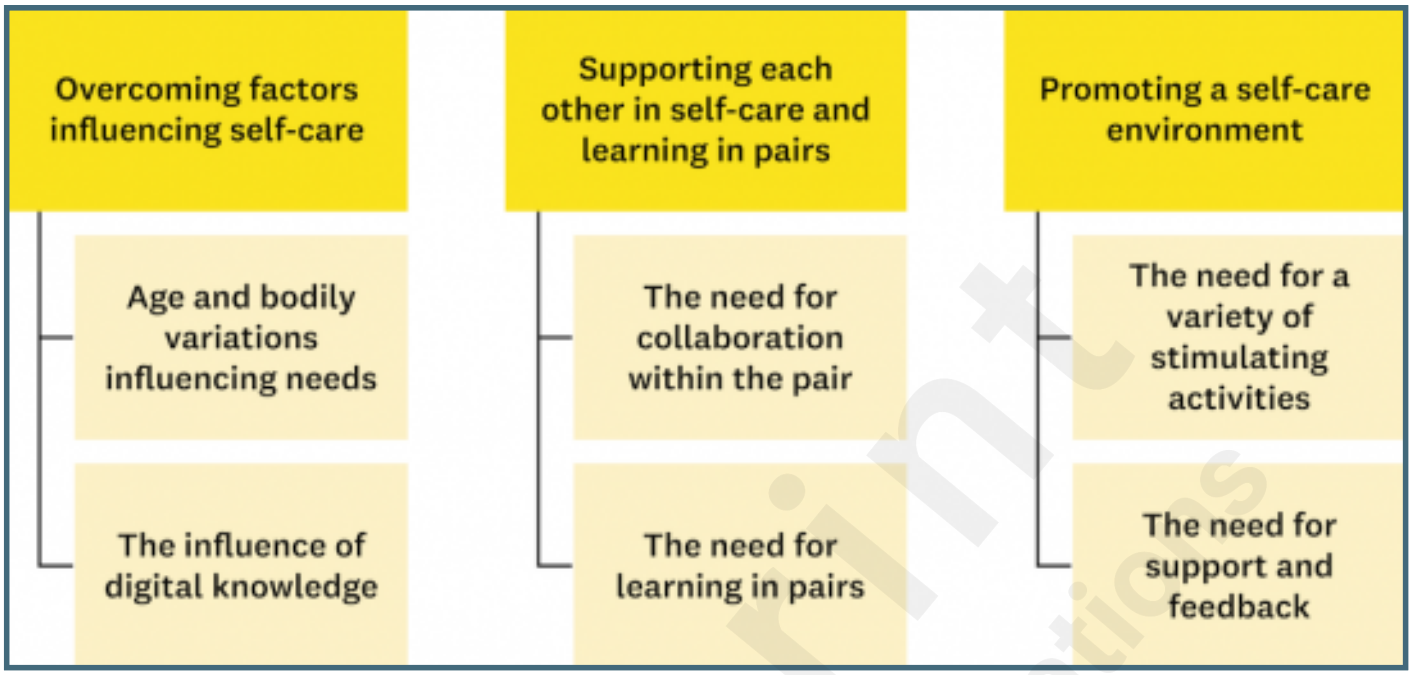
Overview of the three themes and six subthemes of the thematic analysis of factors influencing self-care management among end users when co-creating a video feedback tool.



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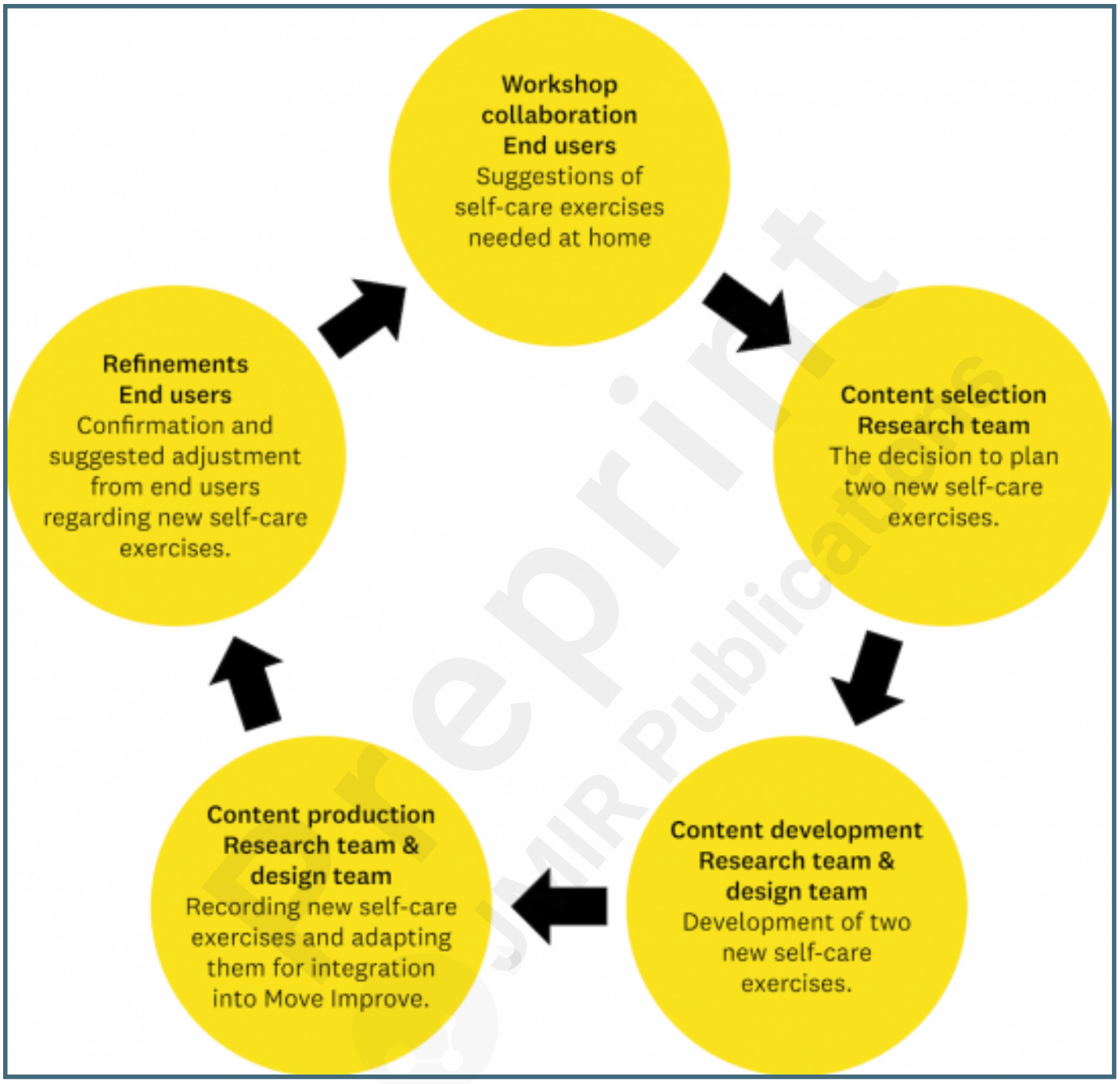
The iterative co-creation process involving all three co-design teams, developing and refining two new self-care exercises in the video feedback tool.



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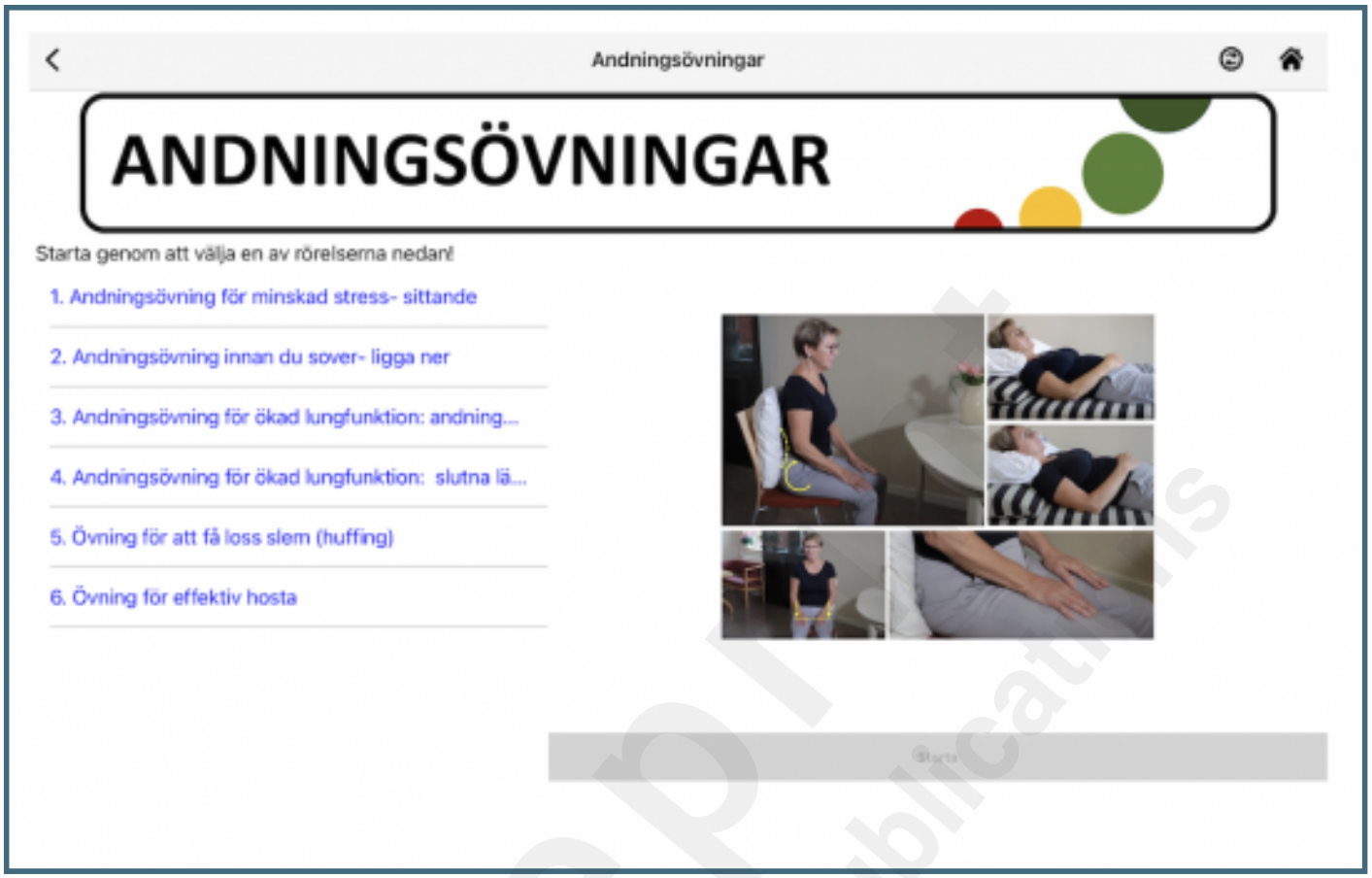
The different exercises in the theme “Breathing exercises” in the Move Improve platform.



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The exercise “Leg and foot strength” in the theme “Pick up from the floor” in the Move Improve platform.

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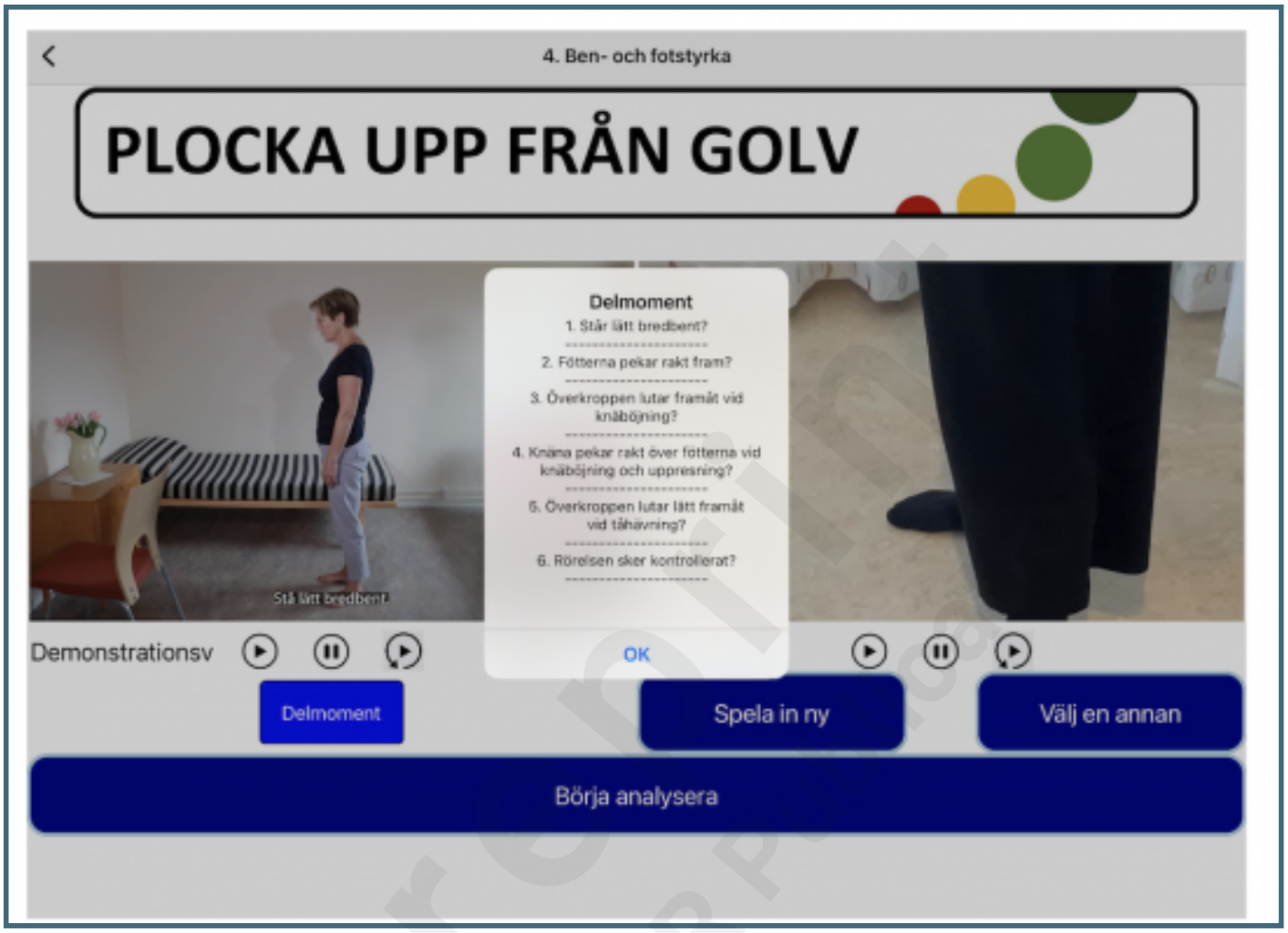
Example of text instruction in the demonstration video can be seen together with the components of the exercise “Leg and foot strength” in the theme “Pick up from the floor”.



Example of the analysis process with new images supporting end users in evaluating their performance of an exercise.

CONSORT (or other) checklists

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COREQ checklist.
URL: http://asset.jmir.pub/assets/23c334bd569234491a0313936ac354a8.pdf

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