

# User Experiences of Mobile Wellness Applications in Health Promotion

## User Study of Wellness Diary, Mobile Coach and SelfRelax

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**Abstract**—An ever-increasing number of people are affected by lifestyle-related health risks, such as overweight, physical inactivity and stress. An ongoing Nuadu trial studies the user acceptance and effectiveness of technologies in supporting the wellness management of working-age citizens. The technologies consist of different Web, mobile and wearable solutions. In this paper, we present the user experience results of three mobile wellness applications: the Wellness Diary, Mobile Coach and SelfRelax. We studied their usefulness, perceived usability, usage habits and motivational factors gathered during the first phase of the trial. The data were collected with user experience questionnaires and interviews, as well as actual usage logs from mobile applications. The findings indicate that the usage habits change during the usage period of more than two months towards more practical ways of use. The results also point out several aspects to be considered when developing future wellness applications for long-term use. These are, e.g. adaptability, versatility, guidance and usability.

**Keywords**—wellness; health risk management; mobile application; user experience; motivation

### I. INTRODUCTION

It is common for working age citizens to suffer from lifestyle-related health problems causing absences from work and loss of productivity. Those in turn bring about high expenses to the society. In addition to the personal perspective and experiences, the society-level impacts produce incentives for supporting preventive approaches in healthcare in contrast to treatment only. With the current societal healthcare resources, there is no possibility to support everyone individually, which makes the role of self-motivation essential. Wellness management, consisting of different types of tasks, such as weight management, physical activity increase, healthy diet and stress level reduction, is usually a long-term process, and in many cases the concrete results are only visible after a long time. The key issue in wellness management is to achieve permanent changes to habits and lifestyle.

For most people changing their habits, and especially maintaining the changes, is a challenging long-term process requiring a lot of personal motivation. Many theories from

psychology describe the various aspects of the process of behavioral change. Among the most interesting and widely utilized are the Transtheoretical Model (TTM) [1] and Cognitive Behavior Therapy (CBT) [2]. TTM describes the process of behavior change in terms of six stages of change: *pre-contemplation*, *contemplation*, *preparation*, *action*, *maintenance* and *termination*. Different approaches are required in each stage in order to optimally support advancing to the next. CBT, in turn, provides various tools for supporting the making and maintaining of behavior changes, such as self-observation and feedback.

Wellness technologies aim to help, support and motivate persons in their wellness management and improvement. This becomes true only if they are designed well, taking into account several usefulness and usability factors. Good user experience is a sum of several different aspects, e.g. the product should respond to user needs, provide a solid and easy-to-learn user interface, and offer pleasant experiences in general [3]. The existing work in the domain of wellness technologies is already quite extensive. Several types of wellness technologies have been designed and launched, e.g. heart rate monitors, step counters, fitness games, health portals and communities, and several research organizations are working in the domain, e.g. [4], [5], [6]. Technological devices and applications, especially mobile ones, may act as powerful persuaders because they can be kept along all the time, allowing timely appropriate persuasions, e.g. in the form of prompts [7]. The disadvantages of mobile devices are certainly the insufficient input and output capabilities. Wellness applications can have a positive impact on wellness, e.g. increase the level of physical activity [8], [5], [9]. However, earlier studies focus on relatively short-term user experiences, i.e. some weeks, and consequently, the existing knowledge lacks aspects of long-term user experiences with wellness applications.

Designing wellness applications for long-term usage is challenging, as they must include successful persuasive elements. Fogg [7] discusses many possibilities to inspire people in the areas of wellness with the help of technological tools. One way to persuade is by an interactive approach

between the user and application by providing timely and contextually appropriate feedback and guidance. Motivational theories reveal other factors, which can help in persuasion. Many theories focus on the motivation towards learning, but elements from these can be utilized in application design as well. For example, Malone & Lepper [10] distinguish the following factors that promote intrinsic motivation: curiosity, control, fantasy, competition, cooperation and recognition. Some of these elements have already been utilized in wellness application design, e.g. the fantasy factor has been used in fitness games like the Nintendo WiiFit, and competition in the applications for social sharing of wellness activities, e.g. Shakra [9] and Houston [11].

The Nuadu trial [12] is an ongoing randomized, controlled trial in Finland. It focuses on wellness management and the management of multiple health risks (overweight, physical inactivity, stress, sleep, etc.). The one-year trial started in the beginning of 2008 and will end by summer 2009. A total of 360 participants, each of them having at least two health risks, and willingness for life-style related changes, are involved in the trial. They have been divided into three groups: *technology group*, *traditional intervention group* and *control group*. All groups participate in the baseline and end measurements consisting of questionnaires, laboratory tests and physiological measurements, and fill in health-related questionnaires at 6 months. The participants in the technology and traditional intervention groups were invited in 5 group-based intervention sessions. In addition, technology group participants have a possibility to use different kinds of wellness technologies throughout the trial, i.e. they have been provided with a toolkit from which they can select the technologies that best suit their individual needs. The toolkit consists of seven wellness technologies, including wearable, mobile and Web-based solutions [12]. The language of the toolkit is Finnish. The participants of the technology group were provided with mobile phones (a choice between Nokia 5500 and Nokia E50) to be used as their personal phone during the trial. The applications were pre-installed on the phones. The applications were introduced briefly to the participants during the baseline measurement session and in more detail in the intervention sessions so that one or two technologies were presented in each intervention session. The technology group participants were also provided with a pedometer (Omron Walking Style II) and weighing scale (Seca 804). The participants in the traditional intervention group receive traditional support after the intervention, i.e. they have an access to occupational health professionals when needed, and are encouraged to self-observe their health and behavior using paper diaries. The intervention designs are based on theories of behavior change, namely the Cognitive Behavior therapy (CBT) and the Transtheoretical model (TTM) [2], [1].

In the Nuadu trial, we have had a unique opportunity to study the user experiences of wellness technologies during a long time period, with a large amount of participants, who all are potential users for the wellness technologies in our focus, and with a set of different kinds of solutions. This paper focuses on one specific topic split from the large research framework: user experiences of mobile applications within the first phase of the trial, i.e. from the baseline measurement to the

last intervention meeting. The research questions of this study were formulated as follows:

- How do the users perceive the applications and their usage?
- How do the usage habits change during the study period?
- What elements of the applications does this target group perceive as motivating in wellness management, and what are the perceived barriers of use?
- What can be learned from the findings for future design of wellness applications, especially for supporting long-term motivation in wellness management?

## II. RESEARCH SETTING

### A. Participant Profile

The participants of our study consisted of 119 (35 males and 84 females) persons, the so called *technology group* of the Nuadu trial.

The participants were employed by the city of Espoo, in Southern Finland. The average age of the participants was 45 years (range: 31-56 years). Out of the participants, 8 had vocational education or had been trained at work, 66 had vocational or polytechnic education and 45 had a Masters level or higher university degree.

The habits of using technologies in general were studied in a baseline questionnaire prior to the trial. Calling and text messaging on mobile phones were used daily, and one fourth of the participants also used the calendar on a daily basis. Over a fifth of them used the camera on mobile phone at least weekly. The mobile internet connection, music player and multimedia messages were used seldom or never. These results are in line with, e.g. [13] and indicate that the participants were ordinary mobile phone users. Approximately 90% of the respondents kept their mobile phones with them during physical activities. The main reasons for keeping the mobile phone along when exercising were: "to be available" and "for safety reasons".

The participants had some experience in the use of wellness technologies prior to the trial. About one third of the respondents had a heart rate monitor (HRM) available prior to the study, but only 3% of them used it actively. A step counter was a slightly more familiar device than the HRM for the participants. Forty-one percent of them had a step counter available prior to the study, and 11% were using it actively.

The self-proclaimed most important and challenging personal wellness topics in the beginning of the study were the following: a figure of 79% of them wanted to increase their exercise activity and fitness level, 66% focused on weight control and eating habits, 38% had goals related to sleep quality and duration, and 31% had stress-related concerns.

The initial attitudes towards the benefits of mobile wellness devices in providing motivation for a healthy lifestyle were quite positive among the participants. A majority (81%) of the participants either agreed or strongly agreed with the statement

"I believe that mobile wellness devices and applications can motivate me towards a healthy lifestyle". On the contrary, only 50% believed that Web-based wellness services can provide the same motivation.

### B. Mobile Applications

We focused on the mobile solutions of the technology toolkit: the Wellness Diary [14], Mobile Coach [15] and SelfRelax [16]. All of them are mobile, stand-alone applications for wellness management and they run on S60 software platform smartphones. However, they differ from each other in several ways, especially in their primary focus, the effort needed by the user to use them, the amount of interactivity and adaptability, and the forms of feedback received by the user.

The Wellness Diary (WD) [17] is a mobile journaling tool for a wide variety of wellness-related self-observation parameters (altogether 17 parameters), such as weight, exercise, steps, eating, stress level, sleep duration and quality, and tobacco and alcohol consumption (Fig. 1). From these parameters the user can select the most suitable ones for her and personalize the application main view accordingly. The entries are made to the application manually on the input forms, preferably on a daily basis, and the application provides graphical feedback of the progress. Every input form on WD contains a free note field where the users can add their own notes. In earlier user studies with WD, the application has been found to be an easy-to-use tool for journaling wellness-related activities. However, the perceived value of the application has been relatively low in short-term use, as making manual entries requires some effort [18] and the feedback graphs are not considered motivating due to the lack of history data [19].

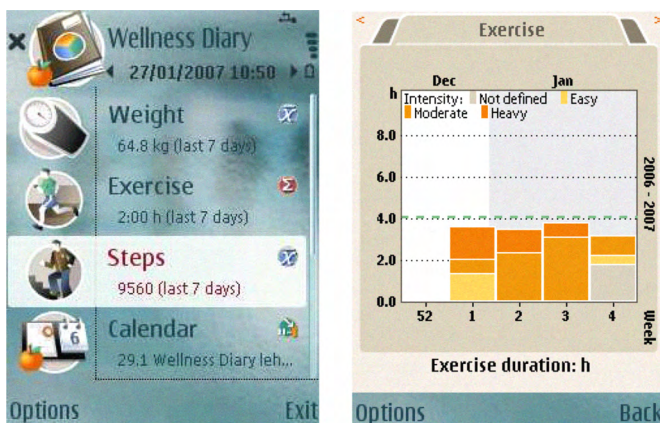


Figure 1. Screenshots of the Wellness Diary: the main view and feedback graph of exercise.

The Mobile Coach (MC) is a mobile application for supporting physical activities (Fig. 2). It automatically generates training plans based on personal goals, including recommendations of the duration and intensity of each training session, and adapts the training program based on the exercises actually performed. The user inputs the performed exercises as the duration of exercise and at least one intensity measure: self-assessed intensity, distance, average heart rate or measured

training effect from a heart rate monitor. MC also provides graphical feedback of the workouts compared to the plan.



Figure 2. Screenshots of the Mobile Coach: the view for entering the conducted exercise and the exercise summary of the week.

The SelfRelax (SR) is a mobile relaxation assistant based on personalized relaxation programs (Fig. 3). The user chooses the purpose (sleep, stress, migraine, other pain, or general relaxation) and duration (3, 5, 7, 10, 15, 20 or 30 min) of relaxation, and may also set other personal preferences, such as position, background sounds, and relaxation techniques. The personalized program can be listened on the mobile phone.

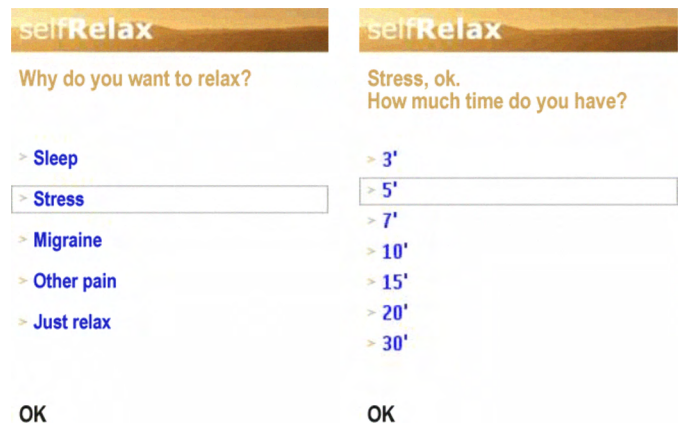


Figure 3. Screenshots of the SelfRelax: selection of the program and setting the duration of the relaxation session.

### C. Data Collection and Analysis Methods

We collected user experience data in three different ways by utilizing the benefits of mixed-methods research [20]: online questionnaires, telephone interviews and application usage log files. The number of participants varied between different data sets due to the response rates of the questionnaires and limited number of interviewees.

The duration of the study period varied from participant to participant due to the ramp-up time of the trial, with the average duration being 73 days (range: 57–116). The variance is due to the waiting period between the baseline measurement and first intervention meeting, the length of which was, on average, 17 days (range: 1–60). The time period from the first intervention meeting to the last meeting was 8 weeks.

The log files were used to get an objective view of the usage frequency of the applications. Log files were manually downloaded from the participants' mobile phones during the fifth intervention meeting. Fifty-eight percent of the mobile phones were reached (i.e. the participants were present at the meeting and had remembered to bring their phones along). To normalize the usage time in the analysis of logs, we analyzed the data in intervals defined by baseline measurement and intervention meetings, i.e. from baseline measurement to first intervention meeting, from the first meeting to the second, and so on.

We launched online questionnaires in three phases: prior to the study (baseline questionnaire), at the time of the initial, independent use of the technologies (pre intervention questionnaire), and finally, soon after the intervention meetings had ended (post intervention questionnaire). Responding to the surveys was voluntary and anonymous. An URL link to the survey was sent to all technology group participants by email. The baseline questionnaire focused on technology use frequency and habits prior to the study (mobile phone, PC and wellness technologies), participants' wellness concerns, and initial opinions and attitudes towards the abilities of the wellness technology in wellness management. We got 95 respondents to the baseline questionnaire. The pre and post intervention questionnaires were identical, and they concerned the use of wellness technologies included in the trial. Their focus was to follow up the users' perceptions of technologies in the independent use after a short introduction (pre intervention questionnaire) and after proper introduction to each application (post intervention questionnaire). We had questions about the frequency of use, and opinions related to the usability, usefulness, motivational factors and the willingness to continue the use. Most questions were statements (e.g. "Application includes appropriate functions for me" or "I'm going to use the application in the future") with a 5-point Likert scale including the following options: disagree, slightly disagree, neutral, slightly agree and agree. For the pre intervention questionnaire we got 87 respondents. A figure of 51 of them stated that they had used WD, 36 had used MC, and 43 had used SR. 60 respondents responded to the post intervention questionnaire. In this phase all of them had used WD and only a few respondents had not used other applications.

TABLE I. THE AMOUNT OF PARTICIPANTS OR RESPONDENTS FOR DIFFERENT DATA COLLECTION METHODS.

	Pre intervention questionnaire	Post intervention questionnaire	Logs	Interviews
N	87	60	66	20

The semi-structured telephone interviews were arranged in the end of the study period of this paper, i.e. after the last intervention meeting. The interviews were arranged for 20 voluntary participants to get a more in-depth view and insight into the user experiences. The interviews covered subjective opinions and feelings evoked by the technologies. More specifically, the questions dealt with the perceived most and least important wellness technologies and the motivations and reasons of use, as well as the barriers of use for them. We also included questions of the experiences related to the start-up

phase and the long-term use of technologies. Each interview took about 25 minutes.

The questionnaires included both quantitative (multiple choice) and qualitative (open-ended) questions, so they generated both types of data. The quantitative data was transferred from the online questionnaire tool to spreadsheets for examination. The log data was treated in the same way. The interview questions were mainly qualitative in nature. The qualitative data from the interviews, questionnaires, and free notes in log files was analyzed by using the content analysis method, i.e. the data was categorized under themes and subthemes that were generated either based on the research questions or occurrence among the data.

### III. RESULTS

This section describes the main findings of the study. The findings are divided under the following themes: ease-of-use, usage habits and their changes, usefulness, motivating factors and barriers of use. The citations provided are authentic comments of the participants from open-ended responses of the questionnaires, or from the interview data. Figures 4 and 5 provide an overview of the post intervention questionnaire responses to four statements concerning usability, functions, motivation and future use of the applications.

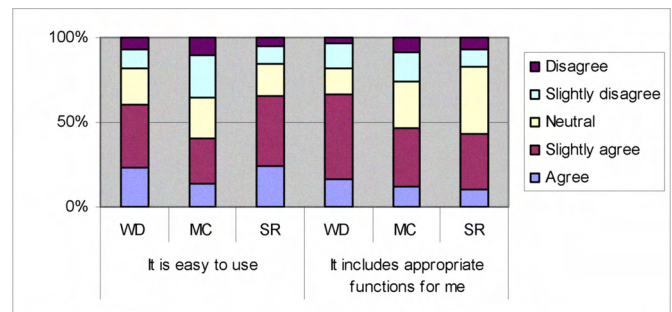


Figure 4. Post intervention questionnaire responses to the statements concerning perceived usability and appropriate functions of the applications. N for WD=60, MC=59 and SR=58.

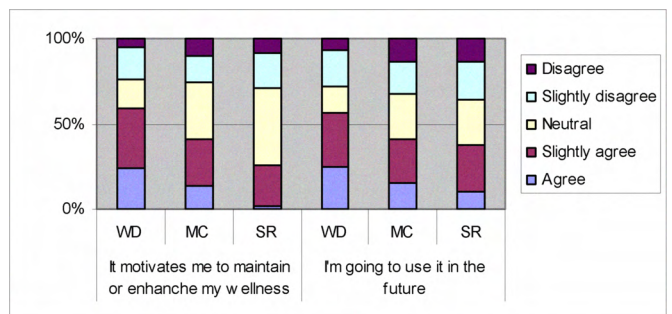


Figure 5. Post intervention questionnaire responses to the statements concerning the motivational role and future use of the applications. N for WD=60, MC=59 and SR=58.

A. Ease-of-Use

According to the interview responses generally concerning all three applications, the opinion was that their usage was quite easy to learn (17/20). The interviewees said that once the usage became a routine, the applications were easy to use. Four out of twenty stated that they would have needed more instructions in the beginning. However, there were differences in the perceived usability between the applications. Based on the questionnaire results (Fig. 4), WD and SR were considered clearly easier to use than MC. Moreover, the interviewees mentioned some difficulties in the use of MC:

*"It was difficult to assess own level of progress... The communication between me and MC didn't work somehow. I didn't learn to set daily programs either."* (female, 47)

Many participants stated that having the application along all the time on phone was a benefit, i.e. it was simple to make the entries:

*"WD is handy as it is in a mobile phone. I just mark daily exercises, steps and weight because it is always with me."* (female, 51)

B. Usage Habits and Their Changes

**Wellness Diary.** The log data shows that ninety-four percent of the participants made wellness-related entries to Wellness Diary. The median number of usage days was 20.5 (range: 1-79) and the number of entries was 76 (range: 1-677). Out of the 17 possible parameters in WD, the participants made at least one entry to a median number of 6 parameters (range: 1-12). The most used wellness parameters in WD were weight, steps and exercise. 85% of participants made weight entries, 80% made steps entries, and 77% made exercise entries. Other parameters had smaller, but often very active user groups.

TABLE II. CHANGES OF USAGE ACTIVITY OF THE APPLICATIONS DURING THE STUDY PERIOD. THE HORIZONTAL LINE INDICATES THE TIME WHEN THE APPLICATION WAS PRESENTED TO THE PARTICIPANTS (E.G, IM1=FIRST INTERVENTION MEETING).

Usage interval	Wellness Diary	Mobile Coach	SelfRelax
Baseline – IM1	65%	9%	30%
IM1 – IM2	73%	11%	12%
IM2 – IM3	62%	15%	6%
IM3 – IM4	58%	21%	3%
IM4 – IM5	53%	18%	12%

Table II shows the how the usage activity of the applications changed during the study period. 65% of the participants used WD during the independent usage (between baseline measurement and first intervention meeting). After the first intervention meeting, where WD was presented, the percentage increased to 73% and declined slightly during the intervention program, being 53% at the time of the last intervention session. The interviewees commented that their usage activity declined mainly because with time their usage habits changed towards more practical:

*"In the beginning I entered exercises, steps, etc. to WD, but then decided to enter only the most essential ones. I have left unnecessary parameters out. In the beginning there was more curiosity, but now the usage has changed to more practical – I just use what I need."* (male, 34)

*"Quite soon it became clear what parameters I would start following up."* (female, 36)

Many interviewees reported that they started making multiple entries at a time, while they in the beginning made each entry separately.

Every self-observation input form on WD contained a free note field where the users could add their own comments. Sixty-five percent of participants made at least one note to WD and the median number of notes was 7 (range: 1-346). Most actively notes were used in exercise (36% of participants), steps (35%), sleep (30%), and eating (28%). Most notes contained more detailed information related to the entry, e.g. foodstuffs in eating, description of activity in exercise or steps, or reasons for poor sleep. Sometimes, the social context or location of activities was reported. In exercise and steps, the note field was also used to explain the lack of activity or poor results.

**Mobile Coach.** Sixty-two percent of participants made an entry to MC at least once, and the median number of entries was 3 (range: 1-40). One fourth of MC users used it actively making at least one entry/week and a median number of 22.5 entries (range: 13-40). The users of MC commented that it required a learning period, as it was more complicated than the other applications. However, when they got used to using it, the usage became regular, like the following quote reveals:

*"As I got used to the use of MC the usage became daily."* (male, 34)

The logs reveal that only 9% of the participants took MC into use initially (Table II). However, the percentage of the participants who used MC increased over time and after the third intervention meeting, where it was presented, it was 21%. When the interventions ended it was still 18%.

According to the interviewees, the usage activity of MC remained high among them because it had features that kept the usage motivation high, i.e. updated exercise programs. The participants reported that they used MC for entering exercises, viewing exercise- and rest-related suggestions and conducted exercises (durations, heart rates):

*"From MC I view what exercises it has recommended for me. If I cannot do it during the same day, I will do it during the week, however."* (female, 44)

*"I have exercised and had resting days according to MC's suggestions. That has felt really good."* (female, 51)

**SelfRelax.** Eighty-three percent of participants listened at least one relaxation session. The median number of usage times was 4 (range: 1-25). Fifty-one percent of SR users used it at least 5 times. A total of 304 relaxation sessions were listened on SR. The most used program duration was 3 minutes (54% of sessions) and the second most used was 5 minutes (19%). The most typical relaxation session was sleep (43% of sessions), the

second was stress (25%), and the third was general relaxation (24%). Moreover, the open-ended questions on the questionnaires revealed that many participants preferred the sleep relaxation, i.e. using the relaxation programs at home in the evening before going to sleep. Sometimes they also used SR at the workplace, as the following comments state:

*"A couple of times when I have had very difficult customers I have taken 3 minutes just to sit and relax."* (female, 43)

*"We have tried it out at workplace as a group. We have had relaxation sessions in the beginning of the day and it got good feedback."* (female, 48)

The usage activity of SR (Table II) declined during the study period. It was independently taken into usage by 30% of the participants, but in the end of the study period the percentage was 12.

### C. Usefulness

This section discusses the perceived usefulness of the applications (from post intervention questionnaire) compared to the self-proclaimed most important and challenging wellness concerns (from the baseline questionnaire).

Out of the participants who named weight control as their main goal, 78% stated that WD included appropriate functions for them. Sixty-five percent of the participants who had named exercise and fitness as their main target stated that WD included appropriate functions for them. Seventy-one percent of the participants who had named stress as their primary target stated that WD included appropriate functions for them. Out of those who named sleeping as their main target, 70% said that WD included appropriate functions.

Out of those who set exercise activity and fitness level as their primary target 43% stated that MC included appropriate functions for them.

Out of the respondents, who named stress control as their primary goal, 36% said that SR included appropriate functions for them. Out of the participants who named sleep quantity and quality as their primary target, 45% considered that SR contained appropriate functions for them.

### D. Motivating Factors on Applications

According to the post intervention questionnaire results (Fig. 5), WD seemed to be the most motivating mobile application in the trial. According to 9/20 interviewees, an important motivational factor in WD was its ability to provide information on the long-term progress of different aspects of wellness, e.g. steps and weight. One participant commented that when having a wellness-related target, for example decreasing weight, WD shows that something is really happening before the concrete results are visible in the body. Even though the weight changes up and down during weeks, WD shows that the trend still remains towards the right direction. The graphs provided were considered to give valuable information as the following quotes state:

*"I like to view progress and declines on the graph for a long-term period."* (female, 51)

*"The diagrams motivate me to try to keep the exercise level high."* (male, 51)

Even though WD was considered motivating due to its ability to show long-term progress, some participants commented that it would suit a cyclic than continuous use better – use it for a while, then have a break, and then use it again for a while to compare the current values to the previous ones.

According to the post intervention questionnaire (Fig. 5), MC had a motivational role in wellness for a great amount of participants. According to the interview results, the participants perceived MC as a personal trainer. It allowed them to see what exercises they should do next. The participants liked the feature that planned the exercises for them. The adaptability of the application was a key point - the participants enjoyed seeing how their physical condition improved with time, and how the application raised the requirements as a result. In addition, the participants appreciated the feature that MC re-planned the week if they wanted to have a break on a certain day. The personal approach of the application and the adaptability were the reasons that kept the participants using and following the training programs. It was commented that the ready-made training programs and coaching are motivating factors towards exercising more.

*"MC plans everything and the user doesn't need to think of the duration or intensity. The application does it for you. You just need to arrange time to do the things that it suggests."* (male, 34)

*"With MC I have exercised notably more than before and in a more versatile way."* (female, 51)

According to the post intervention questionnaire data (Fig. 5), SR did not receive as high rates as the other applications for its perceived motivational capability. The interview data reveals that some participants used SR for quick relaxation in a successful way. A few participants described how they switched SR on sometimes when going to bed, and that it helped in falling asleep. They stated that by using it they were able to relax immediately. Another participant commented that SR was so good that it should be compulsory in every mobile phone. One participant had tried SR in an innovative way:

*"And at the workplace, nursery, I have tried it with kids and they turned silent with the help of that."* (female, 46)

### E. Barriers of Use

The main reason for declines in the usage of wellness applications was being in a hurry. When the participants felt very busy, they did not give attention to the usage of the applications. Another situation when the applications were not usually used was during holidays. Some participants also commented that they had enough technical gadgets in their lives even without wellness applications, and expressed their tiredness in using them:

*"I study besides working and that's why I need to deal with devices all the time. That's why the use of mobile has been quite minimal."* (female, 43)

The mobile device as a platform caused usability-related problems to the target user group. They gave critique towards the font size, which was considered too small, and the size of the buttons of the mobile phone:

*“I don’t use much mobile applications because I cannot read the text properly and do not own reading glasses yet.”* (female, 47)

*“The keys are so small.”* (female, 53)

MC was perceived as too complicated to use by several participants. Some participants stated that they could not, for example, assess the intensity level of the exercise, which was asked by MC. The main issue on MC, however, seemed to be that it was considered to be an application for real exercisers. Participants felt that they should exercise more and do it more intensively to get benefit from the use of MC, and that it did not support everyday activity that they were mainly doing:

*“I don’t need MC: it doesn’t regard everyday exercise which I mainly do. Maybe it would be useful if I would exercise more.”* (male, 51)

*“I would like to get stretching instructions, versatile exercise tips, and instructions from the headset, etc. instead of just abstract intensity and time.”* (female, 34)

Regarding SR, some participants commented that it did not feel appropriate because it was considered monotonous or artificial:

*“SR is a quite good application, but it is too monotonous. I like to meditate so SR is not enough for me.”* (female, 48)

*“SR is quite artificial. I have tried it for a few times, but it doesn’t feel so meaningful that I would bother using it more.”* (female, 46)

Some participants also said that they easily forgot to use SR, and in the appropriate situations, e.g. when sitting on the bus, the outside noise made the relaxation inconvenient.

#### IV. DISCUSSION

We have presented a user study of three different kinds of mobile wellness applications. In general, the applications in focus got a positive response among the participants. In the beginning, many participants seemed to try out different functionalities due to curiosity and because they were looking for the most suitable solutions for themselves. In the end of the period, the usage habits and personal goals had shaped towards more practical and needs related usage of the applications, and active user groups had sprang up for each application. Understanding the purpose of the applications and perceiving them as personally relevant may have increased the usage rate in all applications. Table III summarizes the pros and cons of each application and indicates what their key elements as motivators were.

TABLE III. SUMMARY OF THE MAIN FINDINGS PER APPLICATION.

	Wellness Diary	Mobile Coach	SelfRelax
Ease-of-use	Intuitive, easy	Required learning period	Intuitive
Usefulness	All applications had active user groups		
Motivating factors	Variety of wellness parameters, easy to approach, information on long-term progress, graphs	Updated and adaptable exercise programs, increased requirements, suggestions, coaching	Help in falling asleep and relaxation
Barriers of use	Mobile phone keypad and screen, hectic situations of life		
	Monotonous data entry, does not support cyclic use	Too complicated initially, application for real exercisers, difficult to assess exercise intensity, does not support all forms of exercise	Monotonous, artificial, does not motivate much, easily forgotten, not convenient to use e.g. in bus

The positive design solutions in the Wellness Diary seemed to be clearly its perceived ease-of-use and low threshold to start using. The functionalities and purpose of the application were understandable for the general public. It also supported many different kinds of use cases as it included a great variety of wellness parameters. The main motivating factor on it was the graphs that provided long-term information about the progress. Wellness Diary can be perceived as supporting the challenge factor from the theory of the intrinsic motivation [10] as it displays the progress towards the goals. The free form notes were used quite actively, which indicates the need of recording qualitative experiences in addition to quantitative data. However, the problem of WD was that making entries became monotonous in the long run. Participants wanted to use it in the cyclic way, i.e. the application should be adaptive for intended breaks during the use, and support easy restart after the break. As such, WD does not include persuasive elements but the usage of it depends on the user’s intrinsic motivation towards her wellness goals. By adding some persuasiveness to WD its role could be changed from a simple diary tool to the personal motivator. Timely and contextually appropriate prompts and notifications could be one way to add persuasiveness [7]. Explicit recognition [10] of achieving the targets or sub targets would probably work in this kind of an application. Elements to add curiosity or playfulness could also be utilized in the future design, although it depends on the target user group whether those would be wanted or accepted. One possibility to increase curiosity would be to update new elements and features on the application as the time goes by.

On the other hand, while being more challenging to understand and learn, Mobile Coach provided solutions that the participants perceived motivating and persuading. Those included the adaptable training programs and goals, and other forms of coaching. This kind of adapting approach can be more interesting than a static approach in the long term use. Out of the factors of intrinsic motivation [10], MC currently utilizes curiosity, challenge and control. Possibilities for the future design of MC could include adding social features to the

application and thus support co-operation and competition as motivational factors. However, the designers should consider how to fix the main barrier of use, i.e. usability problems.

SelfRelax was perceived as intuitive to use, and there were participants who considered it beneficial. It helped them in falling asleep and relaxing. The considerations for the future design of SR relate to its potential usage locations and provided variations. First of all, it was not convenient to use the application in situations such as sitting on the bus because of the background noise. Another problem related to perceived monotonousness and artificiality. More natural and versatile ways for relaxing could be utilized in the future designs.

The strength of the study was that a large number of participants who were ordinary people and not e.g. technologically oriented, were studied for a long-term period in the randomized, controlled trial. The data collection methods generated a lot of complementary data. The main limitation of the study was the great variation of the usage periods among the participants due to the ramp-up time of the trial. As future work, we will analyze the user experiences during the entire trial duration. We will also analyze the usage of the Web service in the toolkit in relation to the mobile applications. In addition, we will study the user experiences with relation to the background information of the participants, such as gender and age.

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