MyData Approach for Personal Health – A Service Design Case for Young Athletes

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Abstract
Collecting a digital footprint of data from one’s everyday activities is becoming an information source for preventive health care. Wearable sensor technologies combined with mobile phone applications offer an interesting way to collect and monitor personal activity data for personal use, in addition to providing information for wellness and health care professionals. In this paper we present our service design approach for designing a mobile MyData Wellness concept that was developed for young athletes. The concept aims to combine different possibilities of mobile technologies to create a tool that can provide versatile support for wellness. The salient findings from the concept evaluation show that active young people find tracking sports data motivating and interesting, and call for a unified service that combines different wellness-related aspects of life.

1. Introduction
In the modern world, the cost of healthcare systems on society is becoming an increasing area of concern, and there are several trends contributing to the overall concern over the health of citizens. According to the World Health Organization, more than 1.9 billion adults were overweight in 2014, and on a global scale, obesity has more than doubled since 1980 [24]. Reasons such as obesity, the ageing population and changing socio-economical structures have led both healthcare systems as well as individuals to turn their attention towards technology and its possibilities in helping us to follow and improve our physical well-being and to prevent illness. Tomorrow’s health-related systems and services will increasingly take advantage of a myriad of different sensor systems, which can track our physical activity and everyday life. Today, sensor technologies have achieved a sufficient level of technical feasibility, miniaturization and cost efficiency as to be able to be easily integrated into various types of everyday objects. This enables an omnipresent tracking of our activities, which consequently provides an overview of our lifestyle. The role of technology in monitoring our everyday activities, physical exercise and overall lifestyle is promising, but requires yet more research and development work both for the technical aspects as well as for usable application, system and service design.

Wellness gadgets that collect data on our sports performance, such as heart rate monitors and step counters, have been available for large audiences for years. Research on mobile wellness technologies has looked at the application space from different angles, including, e.g., the perfection of sports techniques [17], social sharing [5] and user experience design [4]. Wearable sensors integrated to clothes and other wearable form factors are about to take off on a large scale. This results in increasing amounts of personal activity data being collected.

Approaches, such as that described by the MyData model [16], highlight the importance of personal ownership of one’s health data, and become critical as the number of sources and potential output channels for an individual’s health data increase. This approach has gained attention from the privacy and security points of view, and it provides challenges also for the technical and user experience design. One challenge is how these different kinds of applications can be integrated to a seamless, understandable and useful service solution. Research so far has focused on designing and evaluating individual systems (e.g. [2][4][5][13]). In our research, our interest was to look at a more holistic approach to a user’s lifestyle, and to bind several different wellness application areas together. Moreover, our focus was not on the technical design, but in the design process that supports such a holistic approach.

In this paper, we present our concept designs for mobile apps targeted to the persona of an active young person, more specifically an ice-hockey-playing teenager. With this concept, we aim to demonstrate a holistic view of collecting and presenting wellness data that forms part of the MyData ecosystem and contributes to the user’s overall health and well-being.
2. Related Work

2.1. Mobile Wellness Applications

Different kinds of mobile sensor systems are increasingly being used in the sports training context. Numerous sports tracking applications exist for mobile phones, smart watches, bracelets and other wearable sensors are becoming increasingly popular form factors for detecting location, physical activity and biometric data. Design guidelines for encouraging people to physical activity have been proposed, and Consolvo et al. [6] conclude the key design requirements to 1) give users proper credit for their activities, 2) provide personal awareness of the activity level, 3) support social influence and 4) consider the practical constraints of users’ lifestyles. Ahtinen et al. [1] list advising, acknowledging, growing and engaging to be the core design principles for mobile wellness applications for supporting physical activity. Oinas-Kukkonen and Harjumaa have looked at persuasive technologies with a more general scope, and introduce a framework that contains system features that assess the primary task, dialogue, system credibility and social support [19].

Numerous applications and technologies have been designed and assessed in the area of mobile wellness. Often mobile wellness trackers and other gadgets are integrated in or combined with smart phones. Mobile phones, especially the so called smart phones, are an interesting and practical platform for wellness technologies because of their form factor, mobility and connectivity features. Ahtinen et al. [3] report that one of the key benefits the users saw in a mobile phone wellness tracking app was that integrating the sports tracking to daily routines was easy as they already carried the phone with them anyway. Research has introduced numerous mobile phone application concepts, which aim to motivate people for physical exercise. For instance, in [7], mobile phones are used as information displays, where a visual representation of a flower garden represents an exercise activity and provides a quick overview with at a glance. In [2], teams of users collect cumulative step counts to achieve a goal measured as a distance on a game map. Mobile phones are also used for pervasive games, as in [14], where players go around the city where the playground is set to find location-specific bonus points. In addition to playful approaches, mobile technology has been used for improving technique in sports, such as in running in [17].

Since early days of research demos, the market for mobile phone wellness apps has exploded in the numbers of both applications and users. In addition to hobbyists and professional athletes, a quantified-self user group has emerged, following and logging actively different types of health related data [11]. However, there is still much to be done in the area of mobile wellness applications. When investigating 39 popular (most downloaded) mobile phone wellness apps, it was found that most applications were still lacking guidance and target setting features [9]. Moreover, tracking technology is also being integrated to clothes and wearable accessories, examples including products such as the Oura ring [18] and Nike+ sensor shoes. These types of new wearable form factors provide interesting opportunities, e.g., to improve detection accuracy and to develop applications for special target groups.

2.2. Methodological Approach

Our research methodology falls in the areas of user centric design, user experience (UX) design and service design, which partially overlap. Generally, a user centric design approach means applying methods which keep the target user involved in the design process throughout the whole design cycle. User experience (UX) goes beyond the definition of usability - efficiency, effectiveness and user satisfaction - which has traditionally been the key concept when user interface design goals are set [12]. User experience design does not consider only the instrumental value of the interactive artifact but highlights that emotion and affect have important roles in the holistic perception, such as aesthetics, emotional engagement and stimulation [10]. Whereas usability measures have been applied to application-oriented research for a long time, UX design and research has so far gained less attention. In the systematic literature review covering almost 700 ubiquitous computing research articles, it was found that only 60, i.e. less than 10%, contained UX research aspects [23]. However, UX research, considering both utilitarian and hedonic aspects in product use, aims at giving a more holistic and realistic picture of users’ perceptions when interacting with the system than purely usability-oriented research. In addition to user experience design and with the aim of designing for a holistic user experience, our research takes influence from research through the design approach [26]. Here the phenomena are investigated through developed design artifacts.

Service Design has its roots in design research, and it has adopted working traditions from several fields including social sciences, marketing, business management and industrial design [21]. In essence, Service Design means applying Product Design methods in creating and improving services instead of tangible design artifacts. Its purpose has been creating and improving services around both immaterial and
material products [15]. The service design process involves different stakeholders, e.g., service providers and consumers. It also emphasizes the approach where the design case is viewed from the user’s angle, and favors co-creation methods in concept design.

In the service design approach applied to our research, we utilize user centric design methods. Moreover, user experience design contributes to the process, as high fidelity design prototypes are used to articulate and communicate the concept, and in later phase as probes in the evaluation of the concept. The aim is that these prototypes represent polished design and have a high enough maturity level in order to provoke comments of both the utilitarian and hedonic aspects of the UX design. Business ecosystem aspects also contribute to the holistic service design by shaping and refining the use cases, although they are not in the core focus of our research. The framework for the methodological approach is illustrated in Figure 1.

2.3. Positioning of Our Research

Whereas most research has focused on developing and demonstrating a specific application, our research focuses on investigating a holistic service design case, utilizing mobile technology for health and wellness. As the target user group we have a teenager, who has sports as a hobby, here: ice hockey. This user group has so far gained little attention among research on tracking people’s physical activity, most cases targeting either adults or the elderly (e.g. [20]), or teenagers who need more activation for physical exercise [22].

Moreover, in this paper we wish to present our design process, which is grounded on service design. We believe that the description of our design process offers practical insights into other researchers, and provides valuable information when aiming to develop service concepts either for wellness or other domain.

3. Design Process

3.1. Process Overview

The aim of the research was to develop a mobile wellness service design concept for a teenager athlete by following a service design approach. The overall design process included the following main phases

- Concepting workshops
- Concept design
- Creating a video presenting the key use cases
- Prototype creation
- Concept evaluation in the field

3.2. Service Concepting Workshops

Our design process began with a workshop, where we applied the service design approach through selected methodologies. The workshops were driven and facilitated by service designers, but included a multidisciplinary set of participants. As outcome, the workshops resulted in the creation of

- a persona
- a stakeholder map
- a day-in-the-life story
- service chain descriptions

3.2.1. Starting Point for the Workshops. The aim of the design was to look at holistic wellness and health related data collection and use. The design was grounded on the MyData approach – i.e. the user’s digital footprint as a versatile set of information sources, personal ownership of the data and sharing of this data with the user’s permission. We focused on active youth as a user group, and developed a persona that would function as a design and communication tool throughout the design process. A persona is an archetype of a user, who embodies the key characteristics, goals and needs of the target user group. Here, our persona was a 13-
year-old athlete, more precisely an ice hockey player, who we named ‘Niklas’.

3.2.2. First Workshop. The aim of the first workshop was to understand the different stakeholders related to our persona Niklas. The output identified a large number of stakeholders, who could potentially provide and support a young person’s everyday well-being.

![Figure 2. Illustration of the day-in-the-life story. The language is Finnish, as presented in the workshop.](image)

3.2.3. Second Workshop. For the follow-up workshop, a day-in-the-life of our young athlete persona was constructed, illustrated in its original form in Figure 2. The story around Niklas described his everyday life, which included school, eating habits, hanging around with friends, going to ice hockey trainings and playing, and evening routines. This story was presented in the second service design workshop. This workshop had the focus more on the service provider point of view, and included 13 participants from six start-up companies.

In the workshop, the first task for the participants was to ideate and visualize their companies’ current and future services and know-how by mapping details to the sticky notes in respect to Niklas’s day-in-the-life story. The next step was to identify possible links between service elements, in order to construct larger service schemes through collaboration. The participants worked in groups, Figure 3, and every group got a piece of string which they used to construct and visualize collaborations between the existing or future services, or create totally new service networks. These company collaboration scenarios helped us to ideate the very first application concepts for Niklas.

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The output materials from the Service Design workshops enabled us to create 3 concept designs for mobile apps for young athletes: MyData Training app, MyData Healthy Eating Guidance app and Ask! app. These concepts are explained in more detail in the following sections, and they were further utilized in the third service design workshop.

3.2.4. Third Workshop. The developed demo concepts were presented in the third workshop, which included companies, researchers and professionals from the health care sector. In total, there were 14 participants, including a few people who had also attended the second workshop. The third workshop commenced by going through a more detailed version of Niklas’s day. Here, as the story progressed, it was demonstrated how applications supported Niklas’s day. After this, the first task was to discuss value drivers in each demo concept from the customer and company viewpoints. The participants, working in small groups, wrote down their thoughts about each concept on sticky notes and discussed the value networks around the concepts. This was followed by a task to ideate further service concepts utilizing health-related MyData from a young person’s perspective. The preliminary demo concepts worked as a platform, which helped to brainstorm and develop the services further.

3.3. MyData Mobile App Concepts

This section introduces the three mobile application concepts that were designed and prototyped in parallel to the concept workshops, as described above.

The first concept, the MyData Training app, is a training app where Niklas can check his performance after the training session and compare it to those of other players and teams (Figure 4). The activity data is collected from sensors built into the player’s hockey gear. The information is accessible to the user, but also to their coaches, health professionals and parents if sharing has been agreed, following the principles of the MyData approach.
The second application concept is a Healthy Eating Guidance app, where Niklas gets personalized nutrition advice when shopping (Figure 5). The app identifies products on the shelves of the supermarket and gives the user recommendations on what to eat. Niklas can also take photos of his meals and compare their nutritional values to those of his sports idol's meals. Hence we aim to guide the user towards healthier eating habits.

The third concept was created to answer the user’s questions relating to psychology or puberty. The Ask! concept (Figure 6) gives guidance on issues related to mental well-being, for example, stress, school or friends. Guidance is provided by counselors who are experts in their area. The user can also browse previously asked questions and answers. The Ask! concept gives users an easy way to get personal help from professionals without the feeling of embarrassment.

In addition to the concept and demo design, we created a video showcasing the concepts in their envisioned usage scenarios. The concepts videos introduce scenarios from the daily life of our persona ‘Niklas’, and show how various aspects of personal data collection can be used to enhance his training experience and improve his physical and mental health. To improve the reality presented in the videos we utilized background images presented on back-projected screens. With back-projected screens prototypes can be easily demonstrated with related background images to set the look and feel of the video. The video can be viewed in [25].

3.4. Prototyping

3.4.1. Creating the mobile demos. The mobile app prototypes of the concepts described above were done by using common user interface (UI) design methods and workflow. First, UI design sketches were developed to early drafts of the UI design and explored with the Sketch application for Mac OS X. The Marvel app prototyping application was used to build interactive prototypes for a touch screen mobile phone, which was then used in the evaluation process. The interactive demo is shown in Figures 4, 5 and 6. The smartphone used in the evaluation setup was an Apple iPhone 6.
3.4.1. Creating wearable mock-ups. In addition to the mobile apps, the application concept introduced the idea of collecting activity data with wearable sensors. As part of the concept, sensor tags were attached to the player’s gear, and a smart phone user interface (UI) was used for viewing the collected data.

The wearable parts of the concept prototype were created by using traditional design process methods. Based on the background information, the physical parts of the concept were exposed to an open ideation among designers. First, a large number of different sketches were drawn to find out possible places and situations where the sensor parts would be suitable.

The tangible sensor concepts from the open ideation rounds were iterated further, making the ideas much more specific and refined. After the first round of sketches, concept pictures were remade with computer, see Figure 7, and visualized in their real context. That kind of scenario drawing helps to understand how products behave and work in their real surroundings. Finally, real physical sticker mock-ups were made with vinyl cutter using previously created shapes with computer, see Figure 8.

4. Evaluation

4.1. Evaluation Process

The evaluation of the concept made use of the prototypes developed and was conducted with the target users, i.e. young athletes. The evaluation process included 1) introduction of the wearable prototypes, 2) simulated data collection session during sports training, 3) introduction of the whole service concept and mobile prototypes after the sports training session, and 4) collecting feedback and ideas. In addition, as future work, the evaluation process will continue with expert interviews organized with sports coaches, who we wish to comment the concept from their point of view.

In order to evaluate the concepts, an evaluation workshop was organized with a team of 13-year-old ice hockey players. The test and feedback session with young athletes was made in the field, i.e. an ice skating rink, during a standard training session in the city of Oulu, Finland. In all, the evaluation session lasted approximately 2.5 hours.

Before the training, the mock-ups of the sensor stickers were attached to eight ice hockey players, Figure 9. The players were wearing the sensor stickers throughout the whole training session. The sensor mock-ups were introduced to the team using a wizard-of-Oz type technique. In this method, the prototype is not made fully functional, but some features are simulated – however, the user perceives a functional and interactive system. The wizard-of-Oz technique is a
widely used method when studying technology concepts, as it saves the implementation effort and allows faster evaluation rounds [8]. In our study, the data collection with the sensor tags was simulated (i.e. no personal data was recorded), although the participants perceived it as functional prototype collecting activity data from the training session. After the ice trainings we had group sessions, where we interviewed the players about the sensors and what kind of measurements they would like to have, showing also the simulated smart phone application to the players. Here, we again presented the UI views in the wizard-of-Oz manner, i.e. creating an illusion that the sensor data had been collected during the training sessions. In addition, we presented the other mobile wellness demos on the developed concepts and asked questions around the needs that young people have during their everyday lives (Figure 10).

![Figure 10. Teenage hockey players giving feedback on the concepts in an evaluation session after ice hockey training.](image)

4.2. Evaluation Results

Generally, the feedback on the presented MyData Concepts for Young Athletes concept was very positive and the users were very enthusiastic. The teenage ice hockey players actively gave comments on the concepts, especially relating to the wearable sensors, and suggested and ideated more. In the following, the salient themes have been reported in more detail.

4.2.1. Tracking Own Performance with Wearable Sensors. Tracking one’s own performance and following the trainings and one’s progress in (the specific) sport type was perceived as interesting and positive. Seeing one’s own development in the sport was commented to increase the motivation to train more.

Collecting the sensor data during the training was perceived very interesting, and provoked many enthusiastic comments, e.g.: “Cool! It would be handy [to see] how you have trained, and then you could always compare to the earlier [ones], if you have made any progress” and “Then you maybe hit it [the training] harder, and want to improve your own performance all the time, and you like know that you have been training… and where you need to improve more”.

The sensor tags were perceived very positively. The players especially liked the ability to stick them anywhere in or on the sports gear, and commented how they would like to change the location of the tags every now and then to follow different parameters according to their needs and interests - e.g. how hard you hit with the stick, how many hits you get in the upper body, etc. Moreover, the sensor tags were seen also a way to follow their own training and performance outside of the coaching and official training sessions, e.g., when playing on the home yard or street with friends. The ability to personally change the tag locations was also seen interesting for comparing different sports: “One could compare where indoors hockey is, for instance, faster than ice hockey”.

4.2.3. All in One Service. The wish to integrate different data sources and applications under one holistic concept was verbalized frequently. Altogether, the presented three concepts (Training, Eating, Ask! apps) were all liked, but it was wished that they would be more seamlessly integrated under one mobile service. According to our teenage hockey players, young active athletes have a need for a holistic application or mobile service, where you can find all in one place – sports, hobbies, diet, free time and family. Combining different information sources was suggested, e.g., in comments such as: “[I would like to have] some meter of how much sweet stuff you can still eat, but then it was combined with the information about how much you have had exercise, and they you would know how much you can eat”. Moreover, teenagers commented that there is a need for a support in other sectors than just sports and physical exercise, e.g., with topics such as eating or bullying.

As critique, sleep was noticed to be a missing parameter from the concepts. Its importance was mentioned several times, as for instance in the comment “Sleep, nutrition, training – these are the three most important ones”.

Mobile phones were seen as a good platform for accessing the information and as a user interface, as phones were already an integral part of everyday life routines and teenagers use them already for a large variety of purposes. Mobile phones themselves would support well the idea of ‘all in one’ service.
4.2.4. Sharing Aspects. The sharing aspects were commented from several angles. The wearable sensors and detecting the training data from the whole team was seen positive, and provoked lots of comments where players were interested in the feature. “It would be nice to know where you have been in the field, and if there is a game, if the team has been more on the offensive end or the defensive end of the rink”, “it would be interesting to know how some other team was doing in their training”. Altogether, our 13-year-old participants were positive about sharing their personal data both with the team and with their parents.

However, related to Ask! application, concerns about asking questions from an unknown source were raised. Security and reliability of in questions and answers was perceived important, and concerns of someone stalking were also verbalized.

5. Discussion

5.1. Concept Characteristics

Providing personal awareness of the physical activity level is one of the key guidelines when designing mobile wellness applications [6]. Our concept received positive feedback on this, and tracking one’s own performance was perceived as very interesting in our evaluation session with young athletes.

Our concept is an example of how to integrate wearable sensors and a smart phone application for a special user group. Moreover, as part of the design decisions, we aimed towards a cost-efficient and easily replaceable sensor tag solution. It was interesting to see how a player’s ability to place sensors and personalize and change their location was seen as an appealing aspect. In this, the flexibility of the concept was a great benefit. The form factor of attaching (mock-up) sensors as stickers functioned well for the purpose, and allowed easy installation of the (imaginary) sensor technology.

5.2. Methodological Observations

The wizard-of-Oz approach with wearable sensors worked perfectly for the purpose of the concept evaluation. The teenage athletes were confident that the sticker mock-ups were functional, and this increased the validity of the feedback. About the mobile demos, it was found good that the application concepts were designed to a mature enough level to provide a plausible user experience of a real product concept. However, of course, even more mature prototypes were wished for: “This is a bad [SW] version as you can’t write the questions here yourself”. The simulated data was shown only during the interview sessions and not, e.g., available for taking home, and it was explained to the participants that the study was part of an ongoing research. No personal activity data was collected. The well-known wizard-of-Oz technique was found to be an efficient and a relatively light-weight research method for the user study, with no approval processes needed from the research institute, e.g., for ethics.

5.3. Limitations

We recognize the limitations of conducting the research with mock-ups, with which, e.g., the performance of the technology could not be assessed. However, this approach allowed us to conduct a concept validation research easily in field conditions. Altogether there is still much potential that can be developed further in the features as well as in the user experience design of mobile wellness technologies.

5.2. Contribution

As a contribution of our work, we present the following. 1) We explore the use of wellness monitoring in a rarely studied user group, i.e. of young people actively pursuing a sports hobby. 2) We demonstrate the use of Service Design methods in the wellness monitoring domain, and presents the design process that we believe further benefits both researchers and practitioners. In addition, our study 3) highlights aspects and features that our target user group found beneficial in such products, e.g., the ability to move the location of sensors, and personalize the tracking features according to their current interests. Such findings provide a basis for further research in the area. We believe that our finding are useful for both researchers and practitioners that are working on designing services of active youth. In addition, we hope to provide a practical example of a research process that can be utilized also for other domain when designing applications and services for users.

6. Conclusions

By tracking everyday life activities, we can provide services that are integrated to our everyday lives, and create individually focused awareness and information to enable individuals to pursue a healthier lifestyle. In our research, we are interested in creating a holistic mobile wellness concept, which could be used to coach young athletes, more specifically ice hockey players, in their health and wellness related areas, and which utilizes both wearable sensors and a smart phone.
Our salient findings report that a holistic wellness application combining different data sources was well received and even wished for. Tracking one’s own performance was perceived as interesting and useful, and comparing one’s own performance to the team was also regarded as very useful. Teenage athletes appreciated the ability to personalize and change what they were actually measuring, and wanted to track activities outside of the official coaching and training sessions as well. In our future work, our plan is to conduct more user research data by doing interviews of sports coaches, and also implement a functional prototype employing key findings of the current research.

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8. References


25. www.youtube.com/watch?v=GPmClDffpTo (Last accessed Sep 14, 2015)