

# LinkFit: Motivating the elderly to be more active using messaging and progress tracking

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## ABSTRACT

The project was part of an exchange programme at the Department of Industrial Design, Eindhoven University, The Netherlands. This paper investigates physical activity of older adults in an independent living complex. A prototype was made for use in combination with planned activities, that relies on progress tracking and social connection through messages as motivating factors. The prototype and the results of discussing ideas with relevant users and stakeholders are described.

## INTRODUCTION AND MOTIVATION

As we grow older overall strength and muscle mass decreases, bone mass is lower, movement is restricted and cognitive tasks become more challenging [1]. Older adults have to stay active to slow down this decline. Physical activity can improve cardiovascular health, increase endurance [1][2] and also benefits the nervous system, which can affect movement and cognitive tasks. It can improve their movement abilities, balance and even improve self-esteem, which can also suffer because of the limitations they experience [1].

Motivation is the key to any successful exercise routine [2]. This can be directly connected to the activities through for instance keeping track of progress, or it can be of a more social nature such as supportive networks. Sources indicate that social connectedness and supportive networks are of crucial importance and have a positive effect on personal well-being and health [3][4].

## USER AND CONTEXT STUDIES

The project was done in collaboration with Pieter Eiffhuis in Eindhoven, an independent living complex for the elderly. They have the Beweegwinkel ("movement shop") with a movement consultant and a number of healthcare students. One of the main tasks of the Beweegwinkel is to advise people on how they can engage in physical activities. This also involves buying the right equipment and planning and taking part in activities.

The author joined a long walk and two gymnastics sessions with the elderly, which gave some insight into their activities and how they are planned in the living complex. Figure 1 shows images from the activities. An interview with Marlies van Elderen, movement consultant, gave insight into her work, the role of the Beweegwinkel and the motivation and challenges among the elderly. A talk was done with the gymnastics instructor about his views on health and the physical activities of the elderly. The results of these talks and observations are summarised in the next section.

## DEFINING THE TARGET GROUP AND CONTEXT

### The elderly

An initial overview of the elderly as a user group was gained based on similar work of another student [5]. Based on this and visits to Pieter Eiffhuis, a good sense of the target group was gained. This age group goes through transitions such as retirement and moving, and health becomes an increasingly important part of their lives. Independence is important but they can easily become lonely. They value social interaction and this can also act as motivation and meeting with others is sometimes seen as a means to do something [6].



Figure 1: Doing gymnastics (top), planning the walking route (bottom).

However, the group in question said they did exercises mainly to stay healthy and that the social aspects were a bonus. Though they did say the coffee and chat after the gymnastics was nice and they enjoyed doing it together.

There is variation in how much physical activity they do and are able to do. One man was very into running and did this often, while some in the gymnastics group had difficulty doing some basic exercises. The gymnastics instructor explained the point of some exercises, which the



Figure 2: Drinking coffee after gymnastics (top), notice board with activities (bottom).

elderly appreciated because it gave a clear reason to do them. They emphasised the need for optimism at their age. Being able to see, that you have done something and made progress is a big motivation. They think about their health mainly when they feel pain or there is something they can not do; not when they have overcome a challenge or made progress.

In regards to their use of technology, most of them were not to keen on the idea of introducing new technology into their lives.

### Pieter Eiffhuis and the Bewegwinkel

Pieter Eiffhuis is an independant living complex primarily for elderly with about 350 flats. The residents live like in any other flat but they are near other seniors and have some advantages of living in the building. There are already a number of activities taking place in the living complex. Currently they promote them with notices on boards and in the lifts and hallways. Some residents also exercise on their own. There is wireless internet in the Bewegwinkel and wired connections in a computer room. Most residents who use a computer, of which there are some, have their own. See figure 2 for images from the living complex.

### CONCEPT

People who should be more active can be said to be in certain stages of change [7]. In this case the target was primarily the elderly who were at least thinking about taking part in activities or who already do some exercise. The concept should target this group of 55+ elderly and act as

a motivation for them to be more active. The concept aims to do so by registering and displaying their activities to see progress, and by using messages. Below the two parts of the concept are described.

### The message and tracking terminal

The idea is to have terminals with a tablet and an RFID-reader mounted on the wall at one or more meeting points. Here the elderly can register their activity with their keychain and can write messages to other residents; either a personal message or to everyone. The tablet can be docked on the wall or be taken down to type on. They register their activity (cycling, yoga etc.) before they start and that is all they have to do, because for the planned activities the duration is known. There is no need to scan their keychain afterwards. For non-planned activities they choose an activity and a duration from some predefined options.

### The device in their flat

The device in their flat has an e-paper screen that shows their activity and the messages that have been sent to them. The activities are shown with calories and minutes<sup>1</sup> with visual bars that fill up as they progress. The most recent message is shown along with these activity bars. It is connected to a wireless network to retrieve the information. By pressing the single large button on top of the device they can see more messages and a more detailed view of their activities. To scroll through messages there is the knob on the side.

The Bewegwinkel can send messages to the devices to promote activities or provide information. The system is web-based and allows family to see the tracked activities of the elderly. Each device is connected to a private Twitter account that displays the activities, and the family can write small encouraging messages to this account, that will then be shown on the device. To further create awareness about planend activities, the device will glow shortly before one will take place.

### PROTOTYPE

A web-application was made on an iPad as the message and tracking terminal. It was functional to the extent of choosing an activity and writing a message, but did not save the choices for tracking. An RFID-reader was programmed and an RFID-tag was molded into a plastic keychain. The reader was hooked up to a laptop, which should of course not be the case in a finished product, where it would ideally be connected directly to the tablet.

The device for the flat was hand-molded with polymorph plastic. An Arduino board with an LED was added to simulate the light when activities are about to start. To demo the connection and show what would happen when an activity was starting, a simulation could be started from the iPad. The e-paper display was represented using a Kindle e-book reader, which uses this screen technology. The screen cycled through three example images. See figure 3 for images of the prototype.

<sup>1</sup>Possible based on duration and calories for activities. See e.g. <http://www.nutristrategy.com/activitylist.htm>.

## CONCEPT CHOICES AND REASONING

The tablet provides interaction for simple activity selection and offers flexibility in regards to writing messages, because it can easily be moved or placed on a wall.

The idea of tracking their activity came from the elderly saying they like to see their progress, and research indicating that it is a good idea to provide personal awareness of their activity level [8]. The peripheral always-on nature of the device showing the results and using light can increase awareness of physical activity [9]. If used correctly it could also provide positive social pressure to keep up with your friends [8]. Being able to track the activities that are not planned by the Beweegwinkel is important because you should give users credit for what they do as accurately as possible [8].

Different designs were explored before settling on using an angled display for a natural reading angle. The large button on top should present an easy interaction for changing the information displayed, while the dial affords scrolling through content. The device is quite sturdy because it is meant as a stationary device that does not afford mobility.

E-paper displays have shown a lot of potential in regards to e-book readers. The technology is still on the way forward in other domains and has recently been used in products such as price tags and watches. An advantage of this type of screen over a typical LCD is the paperlike appearance that is easier on the eyes and could be more familiar to someone not so accustomed to technology. E-paper also uses a lot less power because it only needs it when the image changes, which in this case is not that often.

The message system adds the possibility to reach the elderly in their flats; something the movement consultant missed. Some elderly feel unsure about joining an activity, so maybe reaching out to them personally could help. Messages from friends can be an encouragement [8] and social connectedness can be important for health and well-being [3]. A similar project noted that some older adults could be driven by their social network to keep themselves physically active [6]. The elderly at the complex like information about their exercises, which is also possible using the messages. The family can also send a message because this can be a motivation, so long as the elderly do not feel like a burden to them [3].

While creating the iPad application and the device, interface guidelines for older adults [10] were followed.

## FEEDBACK

The ideas were discussed with two students who work in the Beweegwinkel. From their point of view being able to reach the elderly in their flats and send information about e.g. specific activities would be a very welcome addition. For setting goals in regards to tracking they know a "fitness norm" that could be used. It would take time because everyone is different, but customising a profile for each resident would be in their opinion be worth the effort. They brought up the issue of faking activities. This is a disad-

vantage of only tracking with registration and not e.g. measuring location or pulse. They thought showing specific information along with the glowing light when activities are about to begin would be a good idea.



Figure 3: Message and tracking terminal with RFID-reader, keychain and iPad application (top). Physical glowing model of device in flat (middle). Representation of e-paper display for device in flat (bottom).

The elderly looked at example messages on the Kindle and pointed out that they could not see who had written them. The source of the message should be clearer. They liked the e-paper display and one even said it was much more "familiar and like paper". They seemed to like the idea that family could send them a message. They were sceptical about the tracking itself and wanted a more clear reason to do it. The goal has to be clear and not reaching it could be a quite negative experience for their age group.

Surprisingly, some suggested adding more data, so they for example would be able to view information about exercises based on disabilities. They were worried about having to use a new piece of technology but a quick test of the iPad application caused no trouble at all. They thought the concept would be more likely to succeed in the future, when everyone would most likely be more used to technological devices such as these.

## DISCUSSION

Similar systems certainly exist that have social capabilities of sending messages or track activity level of users. The author has not come across a system that combines the two aspects or one that tracks activity in the same way avoiding wearable equipment – the idea here being that extremely precise tracking may not be needed.

While caution is advisable when introducing new technologies into the lives of the elderly, we should keep in mind that they are willing to embrace it if the value it adds is strong relative to the cost of adoption [11]. Society of the future will have a large number of capable elderly and more elderly will be able to use computers. The most beneficial services will be those that help maintain social relationships and health [12].

As the elderly mentioned, this system may have a higher chance of success in the future, where the older generation is more accustomed to the use of technology. There is potential for concepts such as this to be integrated in devices the elderly already use in the future – this could for instance be a home tablet device. Although this may be the case, this system does not seem to present any advanced interaction or technical challenges that seniors could not overcome currently. Ideally in the future systems like this that focus on health could be an integrated part of a home complex, and not something they would have to go out of their way to acquire.

## CONCLUSION

Good progress was made toward building a functioning prototype, but there are of course aspects that need more attention or evaluation. A system like this, working with behavioural change, can really only prove its worth over time and has to be implemented through a test phase in order to see the real effects it has. The reward factor after filling a progress bar needs more attention. This could be an important factor, as there has to be a clear incentive to use the system. If the social engagement and progress awareness is not enough, a more clear sign of achievement could be required.

The elderly seemed very hesitant about using such a product, and there is perhaps truth in their comments that there is more potential in this type of system in the future, although it is unlikely to be a problem to use it. The real question is whether they would want to.

Initially, it was found that social engagement and networks could work as a motivation. The same was true for seeing progress and knowing that you have achieved something. The concept was based on these finds, but it can not be concluded whether the solution would provide

enough motivation to really have an impact. But the overall idea of creating a connection between the homes of the elderly and the activities that take place has a lot of potential. Being able to reach them in their flat creates good possibilities to encourage and inform.

Finally, e-paper displays are as of now not widely used outside the realm of books, but the potential of these new display types is worth exploring it seems.

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