2017

Wearables and Wellness for the Young Elderly - Transforming Everyday Lives?

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30TH BLED ECONFERENCE: DIGITAL TRANSFORMATION – FROM CONNECTING THINGS TO TRANSFORMING OUR LIVES (JUNE 18 – 21, 2017, BLED, SLOVENIA)
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University of Maribor Press

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Abstract Mobile and wearable technologies have unique advantages within health and wellness. Current knowledge on wearables shows, however, that users easily abandon them after an initial use period. We wanted to investigate whether adding a social dimension to wearable use would be valuable in the young elderly age group, and investigate user experiences of wearables when introducing them to people not in the traditional target group of fitness wearables and without previous experience of wearables. In this exploratory study aimed at gaining a holistic picture to guide further research, we utilize multiple research methods to gain rich data. We found that the young elderly had a clear interest in the wearable. Introducing a social dimension to the wearable seemed beneficial as the young elderly quickly formed a both supportive and competitive relation. The social connection formed through the device appeared to be value adding for the participants and seems to at least partially address the previously identified barriers.

Keywords: • Young elderly • Third age • Wearables • Wellness • Social wellness • Physical wellness •

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https://doi.org/10.18690/978-961-286-043-1.45 ISBN 978-961-286-043-1

Available at: http://press.um.si.

1 Introduction

Mobile and wearable technologies have unique advantages within health and wellness. Wearables could be a way to help the young elderly to stay active longer and remain well. Even though wearable fitness trackers are not a new technology as such, there is evidence that they have not recently evolved to better meet the requirements of users (Harrison et al 2015).

Smartphones are prevalent among the population, but present problems regarding fitness tracking such as problems with data entry (if manual) and inaccuracy of data (if smartphone is not carried on person at all times). Wearables can solve these problems and could thus be a better choice for sustained wellness (see e.g. Amor and James 2015).

Current knowledge on wearables shows, however, that users easily abandon them after an initial use period. In a Gartner (2016) report it was found that the abandonment rate of smart watches is 29%, and 30% for fitness trackers in a study with more than 9500 participants. Gartner also found that wearable devices are not found useful enough and users easily get bored with them. The perceived value in relation to the price is not found to be compelling enough, especially in the over 45 years age group.

Current wearables only take into account the physical dimension of wellness and they are traditionally targeted mainly at the working age population and already physically active consumers. We wanted to explore (i) how adding a social dimension to wearable use would impact the wellness behaviour in the young elderly participants, and (ii) investigate attitudes towards wearables when introducing them to people not in the traditional target group of fitness wearables and without previous experience of wearables.

We use the term young elderly to describe our target group of active 60-75 year olds (Carlsson and Walden 2016). Our definition of the young elderly is similar to the concept of the third age, except with a narrower age frame. The third age is a concept used to describe the time period between retirement and actual old age, a period 25 to 30 years long (see Sadler 2006). The third age or being young elderly is understood as a period of good, active life.

Starner (2014) defines wearable computers as any body-worn computers that are designed to provide useful services to the user while she is engaged with other tasks. Besides fitness monitors, Starner includes in his definition e.g. MP3 players, smart watches and also smartphones, depending on how they are used. Lazar et al. (2015, pp 635-636) discuss smart devices with the definition “devices that automatically gather information about users or their environment to assist them in gaining knowledge about themselves and/or taking action”. Fernandez (2014) defines wearables in the broadest sense as including any computer devices that can be carried on person with the purpose of assisting the user. We use the term wearable in line with these definitions.

The paper is organized in the following way: after this introductory section we present a literature review of wearables and wellness in section 2. In section 3 we discuss the study design and present the participants chosen for this study. In section 4 we present the results of the study and in section 5 we discuss the findings and the implications of the study.

2 Literature review

2.1 Wearables for wellness

For a useful way to discuss wearable technologies for fitness and wellness, Ananthanarayan and Siek (2012) present a taxonomy consisting of (i) goals and users, (ii) persuasion methods, and (iii) data presentation. An example of a relevant goal is motivating physical activity. Persuasion methods belong to either self-monitoring, social influence or fun interaction. Finally, they suggest that data presentation methods are especially important in wearable devices. Regarding social influence, the authors report studies where positive motivating effects were found, but the boundary conditions of successful social interaction in this context are not clear. In line with this, Schmidt et al. (2015) discuss fitness trackers from the viewpoint of sustaining motivation for using them. They suggest that current trackers are technically sufficient in their ability to capture exercise data, but they fail in supporting users' motivation due to the data not being connected to a clear personal fitness goal.

In a small group study on teenage girls, Toscos et al. (2006) investigated the effect of forming virtual peer groups to support exercise motivation. In a post-trial questionnaire, the participants rated group performance to be the strongest method for motivating behaviour change. Engaging in virtual peer groups appears to transform exercise from a solitary self-monitoring activity to a shared experience.

Fausset et al. (2013) report on a two-week trial where older adults (61-69 years old) were given fitness wearables to use within their everyday life. Despite initial enthusiasm, only three of eight participants reported continued intention to use the technology. Inaccurate data collection lead to lowered motivation and trust in the device. Uncomfortable design and a sense of wasting time when using the device were also problems. No users reported issues with the ease of use of the devices in the trial.

Fritz et al. (2014) interviewed thirty wearable users (from their twenties to mid-60s) who had of their own volition adopted the devices. The duration of use ranged from 3- 54 months. The sample was slanted towards technology-related professions and early adopters. Results suggest that it is beneficial if the system allows support for social interaction. Fritz et al. (2014) found, in line with Fausset et al. (2013), that the accuracy of exercise data was highly important for the users; "appropriate credit for activities is essential for encouraging physical activity" (Fritz et al 2014, p. 495).

In a 10-month in-the-wild study of an activity tracker smartphone app, Gouveia et al. (2015) report that only 14% of the participants continued use of the tracker after two weeks. All of the users quit before the ten-month period was over. They found initial adoption to be correlated to the stage of behaviour change; participants who had identified a need and were preparing for an exercise-related behaviour change exhibited the highest adoption rate. Participants who were already active or in the maintenance stage of their behaviour change were much less inclined to adopt the tracker.

As high rates of abandonment seem to be the norm for activity trackers, Harrison et al. (2015) investigated barriers to use and users' workarounds to the barriers. Their participants (aged 18 to 55) reported main barriers to be related to inaccuracy, design and lack of social functionality. Interestingly, Harrison et al. note that most of these barriers were identified in research already ten years ago, suggesting that fitness wearables have not evolved significantly in this time period.

Lazar et al. (2015) also investigate reasons to abandon wearables; they conclude central reasons to be irrelevant data, too cumbersome usage and the devices not matching the participants' conceptions of themselves.

Preusse et al. (2016) suggest in a study on older adults' acceptance of activity trackers, that targeting barriers could increase their acceptance of wellness devices during the deployment-phase of adoption. Meyer et al. (2015) also investigate factors influencing the acceptance and usability of wearables.

For a recent systematic review on wearable wellness support, please see Warraich (2016).

Discontinuation of use is a clear trend in most studies on fitness wearables. Different writers suggest that sustained use might not always be a necessary goal; if behaviour change is achieved and maintained, the tracker might no longer be needed. On the other hand, there is little evidence that behaviour change is retained in the long run after discontinued use of the wearable. Wearables could play a role in sustaining healthy behaviour also after the initial behaviour change.

Users in many of the studies call for social functionality. Also frequently reported are difficulties with the accuracy and meaningfulness of the collected data. Most of the studies focus on working-age participants, but some specifically target older adults (Preusse et al. 2016, Fausset et al. 2013).

2.2 Dimensions of wellness

Wellness is a concept, which is often described to contain different dimensions. In a wellness model presented by Hettler in 1976 (National Wellness Institute 2017), six dimensions of wellness were introduced: physical, emotional, occupational, spiritual, intellectual and social. In some models, dimensions such as environmental, cultural and

climate are also included (Diener et al. 2009, Dolan et al. 2008, Helliwell 2005, May 2007). In our research we use the six dimensions most frequently mentioned by wellness researchers (for a comprehensive overview of wellness models, see Sell et al. 2017). The dimensions are interrelated to some extent, Figure 1. Physical wellness is supported by the other dimensions of wellness, and vice versa. In this research we are especially interested in the physical and social dimension.

Physical wellness is probably the most well-known dimension of wellness. The benefits of physical activities have been proven in many studies (Galloway and Jokl 2000, Wartburton et al. 2006, Penedo and Dahn 2005). Physical wellness generally refers to an individual´s physical health, physical activity level, nutrition, self-care, and vitality or longevity (Miller and Foster 2006; Brown and Alcoe 2010, Anspaugh et al. 2004).

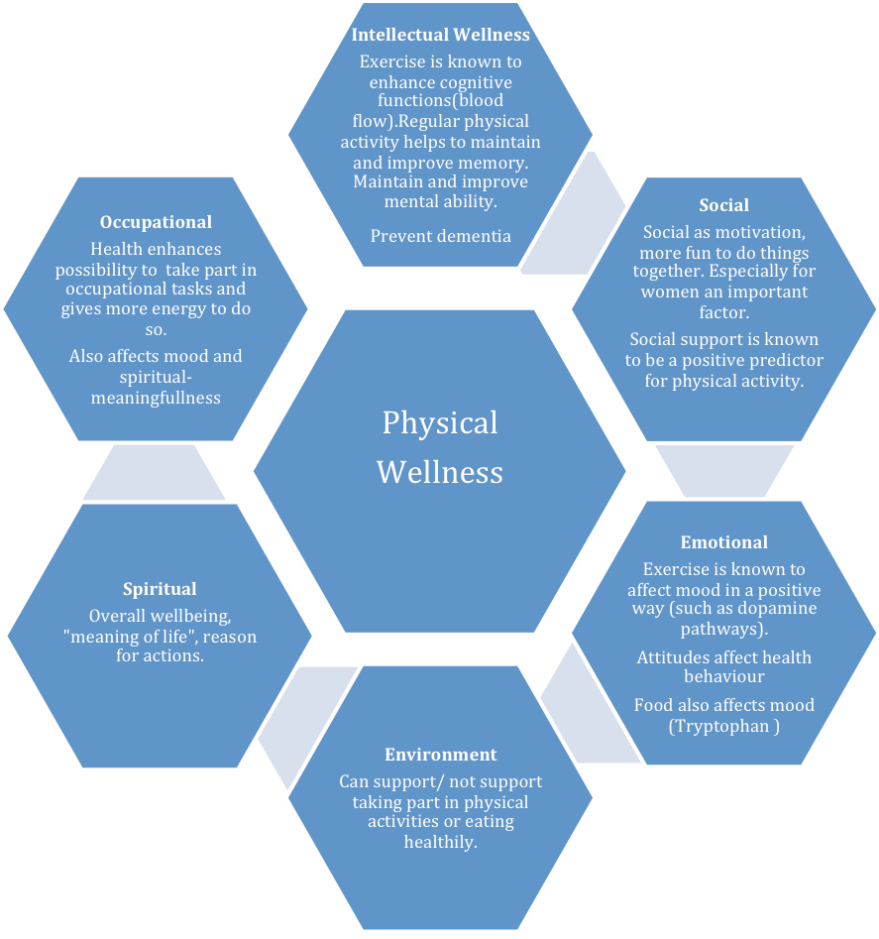

Figure 1: Dimensions of wellness

Social wellness is understood as an "appraisal of one's circumstances and functioning in society", components of which are e.g. social contribution – the feeling that one is a valued, contributing and important member of society, and social integration – the feeling of belonging to a community and having something in common with those within one's social sphere (Keyes 1998, p 122).

Humans have an inbuilt need of social interaction, and deprivation of social interactions is known to be detrimental to health (Leist 2013). Loneliness is a known risk factor for the elderly, associated with a heightened risk for depression (Golden et al. 2009), Alzheimer's disease (Wilson et al. 2007), and coronary disease (Sorkin et al. 2002) as well as an increased risk of mortality among men (Holwerda et al. 2012).

We believe that supporting social interaction and consequently social wellness through technology is possible, but the research evidence is only emerging and still scarce (see e.g. Kang 2007 [general population], Chopik 2016, Baecker et al. 2014 [elderly]). Part of our aim is to gain knowledge on how social interaction can be mediated through technology in order to maintain wellness. With social interaction we mean not only face-to-face interaction, but also e.g. interaction that can be same time / different place, different time / different place.

Physical activities are known to be related to the social dimension. Social support is known to be a positive predictor for physical activities (Trost et al. 2002). Especially for women this relationship is an important aspect (see e.g. Eyler at al. 1999).

3 Participants and study design

This is an exploratory study aiming at gaining a holistic picture to guide further research. We utilize multiple research methods to gain rich data; we employ focus groups, individual interviews, a six-week trial of the target technology divided into three two-week phases with planned interventions, and finally quantitative measurement of the participants' activity levels collected with the Physical Activity Scale for Elderly (PASE) instrument. The PASE results are not reported in this study, as they did not help us understand the participants better.

For the study we recruited five participants, three men and two women, all between the ages of 60-75. All participants were smartphone and computer users, three of the participants also used a tablet computer. None of the participants had experience of wearables. The participants were chosen through purposive sampling with a clear definition on the desired participant profiles. We wanted participants with smartphone experience, within the age range 60 to 75 years old and both male and female.

Aron, born 1942 is a medical doctor. He is married and has a yearly income exceeding 50 000 euros. He is an active computer user and he has a smart phone. His hobbies are singing and participating in different groups, for example rotary.

Barbara, born 1946 has a bachelor's degree and was working within international business. She is married and has a yearly income between 30 000 – 40 000 euros. She is using a computer, a tablet and a smart phone on a daily basis. Her main hobby is volunteer work for the Red Cross.

Carl, born 1946 is a doctor in business administration and is working as a part-time management consultant in his own company. He is married and has a yearly income between 30 000 – 40 000 euros. He is an active computer user and he has a smart phone. He is playing tennis on a regular basis.

Doug, born 1946 has a doctoral degree in political science. He is married and his yearly income exceeds 50 000 euros. He is an active computer user and he has a smart phone. His hobby is cycling.

Ellen, born 1940 has a master's degree in education and has worked in primary education as a language teacher until retirement at age 68. She is divorced and has a yearly income between 30 000 – 40 000 euros. She uses a computer, a tablet and a smart phone. In her free time she goes to the gym, reads and does handicrafts.

For the study we had access to the fitness bracelets Fitbit Charge and Polar Loop. Both bracelets offered similar functions: a pedometer, sleep monitoring, watch, and keeping track of reaching a daily activity goal. The Fitbit allowed forming groups of users who could follow each other's activity levels and send messages to each other. The Fitbit had the possibility of vibrating alarms.

Two participants used a Polar Loop, the Fitbit Charge by the remaining three.

We divided the study into three two-week long phases:

Phase 1
The first phase of the study started in September 2015. Each of the participants was invited to the research institute individually for getting started with the study. The bracelets were set up at the institute together with the participants. The main functionalities were shown individually to the participants and possible questions were addressed. Participants were encouraged to be in touch if any questions or problems would arise.

The pilot group was asked to wear the bracelet on their non-dominant hand. They were instructed to only take the bracelet off while showering/going to the sauna /swimming or while charging it. The activity bracelets synchronized automatically with the phones, throughout the day. After two weeks, a telephone interview was made. At the same time the participants received instructions for the following two week phase of the study, phase 2.

Phase 2

The participants with the Fitbit charge activity tracker were connected with each other, so that they could follow each other's achievements on the Fitbit application. We wanted to test if this social aspect would have a motivational impact on the users. No manipulation was conducted with the Polar Loop users. After two weeks a telephone interview was again conducted. Also the participants received new instructions for the following two week phase of the study, phase 3.

Phase 3

The Fitbit Charge users were promised a free lunch, if they could exceed their steps with 5% from the previous week. All of the three participants managed to do this within the given time-frame. Polar Loop users were not manipulated.
At the end of phase 3, a phone interview was conducted.

4 Findings

4.1 Practical insights

All the participants completed the six-week bracelet trial successfully and had an overall positive experience. There were some practical issues hampering the usage and usefulness of the bracelets however.

One concern shared by all participants was that they like for the wearables to measure also other kind of exercise besides steps, such as cycling, swimming and stretching. Also incidental exercise, such as lifting things or working in the garden does not get recorded.

The sleep monitoring was found useful, but not always accurate. At times, the bracelet seemed to record sleep, even if the user was awake.

The design of the bracelets themselves received some criticism. The Fitbit was difficult to attach on the arm. The attachment is not secure; the bracelet falls off occasionally, even during the night. The Loop on the other hand was difficult to adjust to the right size; to cut the bracelet and get the pins in place. The Loop attachment was also not secure and would open occasionally by itself. On both bracelets, the text on the screen was easy to see.

The information received from the bracelet was seen as enough. The participants lifted out the risk of getting too much information. Also the participants voiced that too many features (such as in smartwatches) might become confusing.

An annoyance was that when charging the wearable, it shows as inactivity on the application.

The participants felt using the bracelet to be motivating. They moved more and checked the steps regularly and made an extra effort to collect enough steps. The achievements during one day mattered more, than the overall weekly report, since the days are so different.

4.2 General observations

Even in this age group, people are not free from peer pressure. One member felt, that it is embarrassing to use a smartphone; many of her friends have not been using computers at work and thus have a skeptical attitude towards technology. This means that elderly taking into use new technology, such as a s fitness bracelet, might benefit from e.g. encouragement from people who matter to the person (see e.g. technology adoption studies).

Things that restrict or hinder the participants from exercising were discussed. The fear of walking alone (for women) and not wanting to travel too far in order to be able to exercise were mentioned. The participants were also encouraged to discuss things that might restrict their friends from exercising, in order to lower inhibitions or shame associated to not exercising. Different ailments were mentioned as an obstacle. Being lazy and being too comfortable at home on the sofa were brought forward, and on the other hand that it is difficult to start something new and take the first step. Other activities might restrict participating in physical exercise, such as devoting time to taking care of grandchildren. Being worried about the way one looks might be a restriction. Also there is a worry that gym personnel or personal trainers are not necessarily knowledgeable or interested in the exercise needs of the elderly.

The focus group participants felt motivated to exercise due to the bracelets. One of the participants was not a frequent walker before the study, but reported finding the joy of being outside through the bracelet trial. The participants reported also other things which motivate them to be physically active. A dog was mentioned as a great motivator for getting outside, also alleviating the fear of walking alone mentioned by the women in the study. The feeling after exercising is motivating, as well as the physical effects of it, such as losing weight and noticing an increase in your flexibility.

One of the themes of the concluding focus group session was different campaigns to promote exercise participation. The focus group participants found benefits in being a member of some social group and doing something together. But they also identified restrictions in this; you cannot walk as fast as you would like to and you have to decide together on a suitable day and time. Virtual campaigns, where the participants are not necessarily exercising at the same time or in the same place on the other hand were criticized for allowing participants to fake that you are doing something while you are not.

The functions that the participants hoped for in a bracelet were a 'stop snoring'-alarm and reminders. They also hoped for alerts when the users' patterns change from the normal, such as sleeping more or less. Body temperature measurement was wished for, as well as possibility to share the data easily with others. The wearable needs to be durable and comfortable to wear in all activities, so it is not forgotten off the hand. It needs to endure swimming, sauna, dirt etc. They also hoped for a GPS function to increase their feeling of safety when moving outside.

4.3 Introducing the social dimension

Current research on fitness wearables indicates that they fail to engage users in the long run. Despite giving the user access to more accurate data on e.g. exercise and sleep than is possible through apps, but something seems to be missing. We wanted to investigate what, if any, impact including a social dimension would have. The participants in our focus group shared many common characteristics, but were not members of the same social network from before. Linking three of the participants together with the bracelet and smartphone app had some effects on their exercise behaviour. They reported experiencing positive peer pressure and elements of competition through seeing each other's achievements. They followed their peers actively and increased their own exercise in order stay ahead of the "competition" or "not be the worst". Also when we at phase 3 applied some external pressure through promising a reward for all participants who increased their step count with 5% or more, all respondents did reach the target, but they reported their main motivation behind it to be keeping abreast with the other participants rather than the reward. The participants also spontaneously started to send each other supportive messages.

The virtual social group enabled the participants to have the feeling of being part of a social activity, without having to deal with the practicalities of actually exercising together and losing their autonomy and independence.

5 Discussion

Based on our experience, we believe that introducing functionality to the young elderly in a sequential manner, rather than all at once, might help overcome adoption-related challenges. An overload of functions is likely to happen when introducing a new device, which might cause confusion to such a degree that satisfaction is low and the will to continue using the device is impacted.

The young elderly focus group had a clear interest in the wearable, even though they do not match the usually advertised target group.

Introducing a social dimension to the wearable seemed beneficial as the young elderly quickly formed a both supportive and competitive relation. This is a novel finding, as

previous research has not highlighted the importance of building in support for the social dimension of wellness in wearables. The social connection formed through the device appeared to be value adding for the participants. The social dimension spurred on the participants to maintain or even increase their level of physical activity, which in itself is an important finding with implications for wellness service design. It seems to at least partially address the previously identified barrier of meaningless data, as giving a social context to the users' data made it more interesting. As a consequence of this, adding a social dimension would likely aid in lowering the abandonment rate of wellness wearables.

The comparison to other users also had a direct impact on the decisions the users were making; the participants could see that their peers were ahead of them in steps and then decide to make their daily walk longer. We found it interesting that the competitiveness was so present and motivational also in this age group. It remains a challenge for future research to investigate whether it is prevalent in the young elderly, and whether it differs between cultures. The trialed devices allowed for social interaction, but we found the functions somewhat limited. With regard to the fact that the social dimension seems to be highly important for motivation, we suggest device manufacturers to put efforts into developing this dimension. For example, the pedometer data is rather one-dimensional and as such might not sustain interest for too long. Adding information about the users' average speed or length of average walks taken might be interesting for the social group. A social function that the participants hoped to see in future devices was the possibility to see where friends are located in order to join them for exercise.

We did not continue to formally follow the participants after the two-month trial, but we have knowledge that at least two of the participants still use the device daily, eighteen months after the trial. This is in itself interesting, as in most studies such long-term use is not achieved. We assume this might be related both to the sequential introduction of functions and the role of the focus group administrator, but this needs to be investigated further.

Limitations of the study at hand include the impossibility of replicating individual case studies and the fact that the results and findings might be different if the study participants would have had a different demographic profile, e.g. have less prior knowledge of technology. On the other hand, our study design enabled us to gain a very rich picture of the participants, which will be helpful in informing and designing future studies. To address the limitations of the current study we are continuing our research with a larger, more heterogenic sample and with different research designs (e.g. a survey study).

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