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Older Adults' Use of and Attitudes toward Activity Monitoring Technologies

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Abstract

Self-management of health is becoming increasingly important in today's healthcare climate. Activity monitoring technologies have the potential to support health self-management by tracking, storing, compiling, and providing feedback about an individual's engagement in movement activities. Older adults represent a fast growing segment of the population who may benefit from such technologies. To understand how to facilitate technology acceptance and adoption, more information is needed about older adults' attitudes and usage of such technologies. Eight older adult participants ($M_{\text{age}} = 65.0$ years; $SD = 3.2$; range = 61–69) used one of four activity monitoring technologies in their own homes for two weeks. Attitudes and usability issues were assessed and evaluated within a technology acceptance framework. Participants' initial attitudes were positive, but after using the technology for two weeks, attitudes were mixed. Three participants indicated they would continue using the technology, whereas five said they would abandon the technology. These data offer insight into older adults' use of and attitudes toward activity monitoring technologies and provide improvement opportunities for designers. The results suggest that efforts should focus on conveying the usefulness and personal benefits of activity monitoring technologies specific to older adults.

INTRODUCTION

Modern medicine is shifting from a model of paternalistic care toward a physician-patient collaborative model with patients responsible for managing more aspects of their own health (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Mitzner, McBride, Barg-Walkow & Rogers, in press). Engagement in certain behaviors, such as adherence to an exercise regimen, is critical for maintaining wellness and managing many chronic conditions. For example, exercise can help to manage arthritis pain (Centers for Disease Control and Prevention [CDC], 2011), a condition that affects 50% of people age 65 and older (Cheng et al., 2010). Additionally, the CDC reports that less than half of all adults meet recommended physical activity guidelines (CDC, 2012). People of all ages must stay active to maintain their health and wellness.

Technology has the potential to support self-management of activity and exercise for older adults by providing information that facilitates understanding one's activity behaviors and

associated decision-making (Mitzner et al., in press). Indeed, activity monitoring technologies are becoming popular in the consumer market. Although activity monitoring technology has been shown to benefit older adults (King et al., 2008; Tudor-Locke et al., 2011), little is known about technology adoption and acceptance over time. For such products to be adopted, they must be designed to meet users' needs and preferences. The design must also consider potential barriers to adoption, such as usability, need for instruction, and privacy concerns, especially for older adults who might have less experience with advanced technologies.

For any technology to provide ongoing benefits for an individual, it must be accepted and adopted initially, as well as on a continuing basis. The Technology Acceptance Model (Davis, 1989) and subsequent extensions (e.g., Unified Theory of Acceptance and Use of Technology; Venkatesh, Morris, Davis, & Davis, 2003) suggested that perceived ease of use and perceived usefulness are the strongest predictors of technology acceptance. In a recent study, perceived usefulness was the strongest predictor of patients' acceptance of a web-based interactive self-management technology; perceived ease of use indirectly influenced acceptance via perceived usefulness (Or et al., 2011).

The goal of this study was to investigate how older adults integrated activity monitoring products into their lives over two weeks in their own homes. This study explored older adults' use of and attitudes toward four activity monitoring technologies (Striiv, Fitbit®, Nike+ FuelBand, and MyFitnessPal). The interactions between older adults and the technologies were evaluated within the framework of the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) to understand how the technologies met or fell short of older adults' needs and expectations.

METHOD

Participants

Four married couples (4 men; 4 women) were recruited from the Georgia Tech HomeLab participant database. Participants were computer users with a computer and Internet connection in their home. They had no prior experience with any of the activity monitoring technologies. The mean age of participants was 65 years ($SD = 3.2$; range = 61–69). Six participants rated their overall health as good or better and were satisfied with their health. Two participants rated their health as fair or worse and were not at all satisfied with their health. Participants were compensated \$75 for participating in this research study.

Technologies

Four off-the-shelf health products were evaluated: Striiv, Fitbit®, Nike+ FuelBand, and [MyFitnessPal.com](https://www.myfitnesspal.com). See Table 1.

The Striiv (Figure 1a) is a wireless smart pedometer that is highly interactive with a color touchscreen, apps, games, and challenges designed to motivate the user. The Striiv can be clipped on to clothing. Striiv also offers a personal online account with which a person can track activity.

Similar to the Striiv, the Fitbit® (Figure 1b) is a wireless activity monitor that users can clip to their clothing. It tracks the number of steps, distance, and calories burned. The Fitbit® syncs to the user's computer to provide data for long-term tracking of activity; there is also a personal online account with which a person can track activity.

The Nike+ FuelBand (Figure 1c) is an activity monitor worn on the wrist. Users must sync their FuelBand with their personal online account to set their daily activity goals and to review their activity history beyond the current day. The FuelBand displays users' progress toward their daily goal and number of steps.

MyFitnessPal (Figure 1d) is a free online calorie counter, food journal, and exercise diary. This website offers an expansive searchable database on food for users to accurately track their calorie consumption. Unlike the aforementioned activity monitors, this website requires the user to enter what exercise was done and the duration.

Materials

Several questionnaires were administered before participants were introduced to their activity monitoring technology (i.e., pre-experience questionnaires); a similar set of questionnaires was administered after 2-weeks of technology use (i.e., post-experience questionnaires). These questionnaires captured participants' general background and health information, technology experience, self-efficacy for health management, locus of control, exercise motivation, and activity monitoring technology opinions.

Participants were interviewed before and after using the activity monitoring technology; the questions were designed to elicit their opinions of and attitudes about activity monitoring technologies. Additionally, participants completed a daily online diary, to gauge their daily use of and attitudes towards the activity monitor.

Procedure

Participants were randomly assigned an activity monitor with the constraint that one male and one female receive each technology. Couples did not receive the same technology. The activity monitor assignments by couple are shown in Table 2.

Upon recruitment into the research study, participants were emailed the consent form and the pre-experience questionnaire; a home visit with a researcher was also scheduled. Participants completed the questionnaire prior to the home visit. After the participant provided consent during the home visit, the researcher reviewed the questionnaire and answered any questions participants had.

Next, the researcher conducted a short interview in which participants answered questions about their attitudes toward activity monitoring technologies and provided their first reactions after watching a short video about the technology they were assigned. The interview was audio recorded. The participants then received their activity monitoring technology and basic training on the device's functions. The initial in-person assessment took approximately one hour.

Participants completed a daily diary to monitor usage of the activity monitoring technology for two weeks. The daily diary logging took less than five minutes each day.

At the end of the two-week period a home visit was scheduled for a final interview and equipment pick-up. The post-experience questionnaires were mailed prior to the home visit. During the final home visit, the researcher conducted the final interview in which use of and attitudes about the activity monitoring technology were discussed. The final home visit took approximately one hour.

RESULTS

Initial Interview

During the initial interview, participants were shown a short video about the activity monitoring technology and provided their first reaction. All of the participants were positive and excited about using the technologies, as evidenced by the following comments:

- “That is interesting. That is exciting. I think it will make me exercise more...”
- “Well, I’m not as tech savvy as my husband, but I will learn it. It looks self-explanatory on the video. You can teach an old dog new tricks. It just takes me a few more times. I like the way that I can attach it to my arm and not have to worry about wearing something with a pocket.”
- “...I like that it is convenient. It’s just a bracelet. It looks good. It’s cool. I’ve got a Nike bracelet, my son will like it.”

Use of Technologies

Six of the eight participants wore technologies that tracked physical activity; two participants tracked their exercise and food intake online using MyFitnessPal. Participants interacted with their technology on average 12 out of 15 days ($SD = 4.8$). The number of days the technology was worn or accessed by participants varied greatly from a minimum of one day to a maximum of 15 days. One participant entered an exercise update on myfitnesspal.com on the first day of the study and never returned to the website. Another participant used the Nike+ FuelBand every day for the first eight days of the study and then stopped using the technology. The remaining six participants used their technologies nearly every day (range: 13–15 days).

Final Interview

Participants provided their opinions on several aspects of the activity monitoring technology after using it for two weeks. See Table 3 for example positive and negative participant responses to the following questions:

- Did the activity monitoring technology meet your expectations?
- What did you like about the activity monitoring technology?
- What did you dislike about the activity monitoring technology?

When asked if they planned on using the activity monitoring technology in the future, participants were divided. Three participants were very excited about continuing to use the technology. One participant said, “Yes, I got one for my birthday this week, and it will be here at the house soon.” Three other participants were on the opposite end of the spectrum. One participant stated, “No. Because the time I spent tracking I could spend doing something else.” The other two participants were ambivalent; they recognized the benefits but were not interested in paying for a technology.

DISCUSSION

We evaluated older adults’ use of and attitudes toward four off-the-shelf activity monitors: Striiv, Fitbit®, Nike+ FuelBand, and MyFitnessPal. These technologies are marketed primarily toward younger adults, but older adults can benefit from them as well. Older adults represent a growing segment of the world population who can benefit from activity monitoring technologies to support self-management of health. However, for such technologies to be adopted and used, the technology must meet the users’ needs. The technology must be useful and easy to use for users to accept it (e.g., Or et al., 2011).

Participants were initially receptive to and excited about using the activity monitoring technologies. This was encouraging because early acceptance can influence later use of technology (Venkatesh, Speier, & Morris, 2002). However, two of the eight participants stopped using the technologies before the end of the two-week study. One stopped after the first day; another stopped after using it for eight days. This pattern suggests that despite being initially receptive to using the technology, participants do not always accept and use the technologies unconditionally. This finding is consistent with the results from Blanson Henkemans and colleagues who described four groups of technology users as “first glimpsers,” “early dropouts,” “late dropouts,” and “maintainers” (Blanson Henkemans, Rogers, & Dumay, 2011).

The final interview data provided insight into reasons why use of the technology was discontinued. Just as the usage varied, attitudes toward the technologies were also mixed after using the technology for two weeks. Three participants were very excited about continuing to use the technology; five others did not intend to continue using the technology.

The results of this study can be explained within the framework of the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) by understanding participants’ perceptions about usefulness and ease of use. For example, some of the participants did not perceive the technologies to be useful. Specifically, the five older adults’ who did not intend to continue using the technology described several issues with the technologies that included inaccurate data collected, wasting time, and uncomfortable to wear. A salient issue that one participant discussed concerned the inaccuracy of the Nike+ FuelBand. He walked one mile on his treadmill while holding onto the support railings (as likely many older adults would do to steady themselves), and the technology recorded zero steps. The participant indicated this was very discouraging; the technology did not meet his expectations or his needs.

An important finding was that there were no reported issues with perceived ease of use with the technologies. This is positive feedback for the technology designers, as the older adults felt they were able to successfully use the products.

These data offer insight into older adults' use of and attitudes toward activity monitoring technologies and provide improvement opportunities for designers. The results from this research suggest that efforts should be focused on conveying the usefulness and personal benefits of activity monitoring technologies specific to older adults. The technologies' capabilities should be tailored to the activities that older adults are most likely to do (e.g., walking).

Research must continue to explore the benefits of activity monitoring technologies for older adults to support their self-management of health. Chronic diseases such as hypertension and diabetes increase with age, but an active lifestyle can reduce the risk of and support management of such diseases (CDC, 2012). Activity monitoring technologies that older adults perceive as easy to use and useful can support a healthy and active lifestyle.

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Figure 1a-1d.

Images of the four activity monitors used in this study.

Table 1.

Characteristics of Activity Monitoring Products

	Wearable	Interactive Display	Website
Striiv	On clothing; in pocket	Yes	Yes
Fitbit®	On clothing; in pocket	No	Yes
Nike+ FuelBand	Wrist only	No	Yes
MyFitnessPal	No	No	Yes

Table 2.

Activity Monitors by Couple

Couple	Female	Male
1	Fitbit®	Nike+ FuelBand
2	Striiv	Fitbit®
3	MyFitnessPal	Striiv
4	Nike+ FuelBand	MyFitnessPal

Table 3.**Final Interview Example Participant Responses: Positive and Negative**

Did the technology meet your expectations?	
Positive (n=6)	More than met it. Because it actually showed me that it tracked everywhere I went—upstairs, downstairs, in my walking around—I was really impressed with it. I kept it in my pocket. [Fitbit® participant]
Negative (n=2)	No. I think I was expecting it to figure more things out for me than it did. Especially the sleep thing, which I was very interested in because I am a crazy sleeper. I don't think it's accurate at all. No, because one night it said I woke up 19 times, and there is no way I could even go the next day if I had woken up 19 times. So I don't think it is very accurate....[Fitbit® participant]
What did you like about the technology?	
Positive (n=6)	It showed me how little or how much I had achieved, and it spurred me on to do more. It made me aware that, hmmm, today I sat around and watched a movie, or today I went to work really early and remembered to put it on when I first got up so it made a big difference in my numbers, so I liked it. [Striiv participant]
Negative (n=2)	Really, I, after the bloom got off of the rose, I didn't like anything about it. Initially, I thought this is going to be really neat—and if it had done what—if I would not have been expecting it to count my steps, I would say I get this. I have to have my body in motion, but I didn't like anything about it. It was not comfortable writing or at night, so I would take it off or move it to the other hand. [Nike+ FuelBand participant]
What did you dislike about the technology?	
Positive (n=3)	What was to dislike? There wasn't really anything to dislike. [Striiv participant]
Negative (n=5)	The inaccuracy. The fact that it was hard to find if I lost it—which I did several times... Then we began to think that it wasn't accurate, so it lost its appeal. [Fitbit® participant]