Long-term Management of Personal Health Information Generated by Activity Trackers

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Abstract

In this position paper, we introduce activity tracker-generated information as a new type of personal health information, identify challenges for long-term management of such information, and discuss research questions for our future work in this area.

Author Keywords

Personal health information management; information behavior; information practice; activity trackers.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

A variety of sensors, such as pedometers, accelerometers, altimeters, compasses, and GPS, are commonly embedded in today's commercial mobile and wearable devices, allowing users of such devices to track their daily physical activities [3, 6, & 14]. These activity tracking devices and their respective health or wellness applications provide users information about their daily physical activity, generating a new type of digital personal health information in need of management. With the term "activity trackers," we

Personal Biographies

Yuanyuan Feng is a PhD candidate in information studies in the College of Computing and Informatics at Drexel University. Advised by Professor Agosto, her research focuses on people's information behavior with mobile and wearable devices.

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refer to all devices that provide activity tracking functions (e.g., Fitbit, Jawbone, smartphones, and smart watches). Our proposed research will investigate the landscape of long-term management of personal health information generated by activity trackers.

Related Work

In personal information management (PIM) research, there is a large body of literature on personal health information management (PHIM) investigating the management of people' personal health information to support their health-related needs and goals [11]. Much of PHIM research takes a patient-centered approach and mainly focuses on information technologies such as personal health record systems (PHRs) that assist patients with their healthcare needs [2, 11]. Less work has focused on studying non-patient general PHIM—the everyday health information management practices of healthy people.

Recently, a rising number of pervasive healthcare technologies, including activity trackers, do not target users with diseases or health conditions but aim at improving users' health status in general [15]. Activity trackers utilize built-in sensors to record information of users' daily physical activities and to present the information to users [1, 3]. Activity tracker-generated information is a new type of personal health information that may interest people with or without diseases or health conditions. Thus managing such information falls into non-patient general PHIM.

A few recent studies have investigated user behavior with activity trackers. Shih and colleagues conducted a six-week user study based on Fitbit usage logs and surveys [12]. They found half of the participants stopped using Fitbit after two weeks and only 9 out of 26 participants ended up in their high usage group. Similarly, Gouveia and colleagues analyzed the usage data of Habito, their own application to study users' engagement with their activity trackers, but only 97 out of 256 users used the application longer than a week [7, p.1308]. Among those who adopted Habito, most users only took brief glances checking out their current activity levels without further interaction [7, p.1309]. The two studies show that major issues of activity tracker usage are low user adoption rates, limited user engagement, and a prevalence of short-lived use.

Current research on user behavior with activity trackers focuses on adoption and usage, with little discussion on users' management behavior of their personal health information provided by activity trackers. We believe that making full use of activity tracker-generated health information may provide users with better long-term health support and encourage users to engage in more consistent digital health information management. Therefore, we aim to examine activity tracker users' PHIM behavior and their relevant concerns with the eventual goal to generate design-based and behavioral suggestions for improving users' PHIM practices.

Research Challenges
We identify several aspects of research challenges for studying long-term management of personal health information generated by activity trackers.

User adoption and engagement
As mentioned above, research findings confirm the issues of low user adoption rates and limited user engagement [7, 12], which may lead to lack of

effective management of personal health information generated by activity trackers. Faced with the challenge, HCI and ubiquitous computing researchers have explored various design approaches to motivate long-term use among users [5]. Improving user adoption rates and user engagement intensity is the premise for researching long-term PHIM of activity tracker-generated information.

PHIM needs

Before diving into the research topic, we should gain an understanding of users' PHIM needs with activity tracker-generated information. Munson proposed personal informatics applications should range from *reflective technologies* (helping users gain insight from their behavior) to *persuasive technologies* (supporting users' behavior changes toward their goals) [10], in order to best address the range of different information needs of users. Still, few studies have looked into users' PHIM needs with activity tracker-generated information, specifically, the need for long-term management of such information [13]. We believe that it is fundamental to research users' PHIM needs to better fathom their PHIM practices of such information.

Practical limitations

Many practical limitations pose challenges to the long-term management of personal health information from activity trackers. **First**, several studies have revealed data accuracy problems and technical issues from both prototype and commercial activity trackers [3, 8, & 12]. **Second**, information fragmentation, a pervasive problem in PIM [9], is likely to exist. Users may lose their activity trackers [8] or own multiple brands or versions of activity trackers [5]. Since PHIM of activity tracker-generated information is highly dependent upon the specific device and its application, achieving long-term management of the information relies on integration of information among multiple devices and applications. **Third**, information privacy is another challenge. Commercial activity tracker users have limited access to their personal health information and little control over the raw data captured by their devices, raising potential personal privacy and security concerns [16]. **Furthermore**, there is the challenge for information representation. Currently, information is often displayed in limited ways that the specific devices and applications support. Because appropriate visualization helps people make sense of their personal health information [4], PHIM of activity tracker-generated information calls for better analytical and visualization tools.

Our Research Questions for Future Work

Previous work has revealed the challenges and research gap of long-term management of personal health information generated by activity trackers. We will address several research questions in our future work:

- How do users manage their personal health information generated by activity trackers?
- What long-term PHIM needs and concerns do they have during the process?
- How can we optimize mobile and wearable technologies to support long-term PHIM of activity tracker-generated information?

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