"I need that data": Exploring the data experience of amateur runners

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Abstract Running is an affordable way of becoming physically active. Currently, amateur runners utilize running trackers to keep records of their training and be aware of their performance. These special type of users experience "data" in addition to the running trackers. While there are studies that examine the experience of physical activity trackers, there is no study that explore the data experience of runners. Thus, this paper explores the dimensions of data experience of amateur runners who employ running trackers to learn about their performance. By giving a brief review of literature, this paper demonstrates how amateur runners experience data and how they expect to be informed, through a qualitative study conducted with 30 amateur runners. The paper will end with design suggestions to support the design of future running trackers that better meet amateur runners' data needs.

Keywords *User experience, Running trackers, Amateur runners, Data experience*

Background of the study

Motivating people to be physically active has been the focus of a great number of studies in the last five years. Mainly, these studies focused on making people aware of themselves, by giving personal information (i.e., their physical activity performance) and motivate them to have better behavior (i.e, to get active). Meanwhile researchers have explored the ways in which people interact with physical activity trackers and how they persuade people to change their behavior positively (Kuru & Forlizzi, 2015). While early research explored aesthetic qualities and game-like visualizations of activity data to motivate people (Arteaga, Kudeki, Woodworth, & Kurniawan, 2010; Consolvo, Everitt, Smith, & Landay, 2006; Consolvo, Klasnja, et al., 2008; Consolvo, McDonald, et al., 2008; Fujiki et al., 2008; Lin, Mamykina, Lindtner, Delojoux, & Strub, 2006; Nelson, Megens, & Peeters, 2012); others focused on the social and motivational aspects of sharing data (Ahtinen et al., 2008; Fialho et al., 2009); and suggested personalization of product appearance (Edwards, McDonald, Zhao, & Humphries, 2013) or the data (Consolvo, McDonald, et al., 2008). Not surprisingly, currently there are several physical activity trackers in the market and people utilize these devices to make healthy decisions. Mainly, these trackers encourage people to take at least 10K steps a day which is perceived to be a good way of staying healthy. This is what make these special class of products serve as persuasive and informative tools, aiming at helping people to "collect and reflect personal information" (Li, Dey, & Forlizzi, 2010).

When people realize that they can walk long distances, running becomes an alternative way of going further and faster. A new type of users emerge as a result of this shift. That is "amateur runners" who expect to learn about their speed, the distance they run or the total calories they burn while running. In time, counting the number of steps taken becomes an insufficient way of witnessing the improvement in self performance. Thus, the personal data is seen as one of the best ways to understand the runner's personal improvement. That is the reason why people tend to use several applications or sports watches to track their running activity. As a result, designing tracking technology for outdoor activities, especially for running is on the rise. While companies like Garmin and Suunto develop activity trackers for outdoor running, understanding needs of amateur runners requires special interest.

Research in running trackers is new relative to research in physical activity trackers. Currently, studies explore how amateur runners experience GPS-based running trackers (Bauer, 2013; Bauer & Kratschmar, 2015; Jennings, Cormack, Coutts, Boyd, & Aughey, 2010; Jensen & Mueller, 2014; Shipway & Jones, 2007; Wozniak, Knaving, Björk, & Fjeld, 2015). For instance, in a recent research, it is suggested that these products should have a special training feature to empower the technique of runners (Jensen & Mueller, 2014). Another research focuses on "social understanding of runners" to find out how technology can help runners during races (Wo niak, Knaving, Björk, & Fjeld, 2015). Thinking that the most important benefit of using running tracker is learning about self, understanding the runners' experience with trackers is essential to further explore the "data experience" of amateur runners. However, while there are lots of studies that assert explain user experience of technological products, the literature lacks an overview of the runners' experience with the personal data. Thus this contribution can lead the developers and interaction designers to put forward the users' data requirements from running trackers to design for better running experience. In this sense, focusing on the runners' data experience has the potential to lead

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designers to understand how to design running trackers and better deliver user data to the amateur runners; to engage runners with the personal data interrupting the flow of running experience.

Meanwhile literature evolved from focusing on usability to user experience, the definition of user experience also evolved. Alben described the user experience of interactive products as a holistic set of factors, including how people feel about a product, how well they understand its functions, how the product makes people feel when using it, and how it fits its purpose and context of its use (1996). A later work posed user experience in interaction design as the interaction between product and user, unfolding in a social and cultural context of use (Forlizzi & Ford, 2000; Hassenzahl, 2003). The experience of interacting with a technology is dynamic, and is affected by many factors, including time, place, goals, emotion, behavior, attitudes, and expectations, and other people. Additionally, people's expectations change with new technology, because new functions and features need to be made sense of and need to be taken into account relative to goals in product use (Hassenzahl, 2008; Nurkka, Kujala, & Kemppainen, 2009; Stelmaszewska, Fields, & Blandford, 2004).

With this regard, in this paper, a new term "data experience" is defined as the ability to inspire and motivate runners, allowing repeated interaction with personal data over time. With this focus, this paper puts forward the details and dimensions of data experience of runners. Details of data experience will be explained in the following lines, with the initial findings of an exploratory study of tracking experience of amateur runners.

Methodology

To understand the dimensions and components of data experience, a qualitative research was conducted by asking 30 amateur runners. The participants were interviewed, and structured analysis was made to find the details of their experience.

Selection of participants

The study was intended to include amateur runners who had been actively running, had attended at least one national race, and had been using technology to track the details of their running performance. The participants were recruited through email, phone or word of mouth. They were invited to participate in the study and after the interview, they were asked whether they knew any other runners who would help in the study.

Data collection

The study was designed as semi-structured interviews. Interviews covered detailed questions about participants' experience with the running trackers and especially their data experience. Their needs and expectations were also asked which would maintain their engagement with the data. The questioned covered: (1) what were their data-related needs that made them use a tracking technology; (2) what kind of data they needed during running and why; (3) what other data-related expectations would lead them to change the product they use. The face to face interviews were conducted mutually agreed time and place. All the interviews were voice recorded with permission. The study did not require any other special setting.

Participants

In total 30 amateur runners (14 female and 16 male whose age ranged from 21 to 40) were selected for the study in accordance with the personal judgments about who may contribute to the study. Of the participants, 21 were using a smart watch to track their experience while 9 was using a mobile app (Table 1). When asked in detail, of the participants 24 had used a mobile app before the current tracker they used; 4 had used a sports watch and 2 had used nothing. Not surprisingly, those who had been using a sports watch to track their training had previously used either a mobile app or another entry level GPS based sports watch. Among the participants, 5 had been training less than one year on regular basis, 15 had been training for one to three years, and 10 had been training more than four years.

Analysis and results

In order to avoid the reductivity of data (Blomberg & Burrell, 2008; Diggins & Tolmie, 2003), data was analyzed by applying Content Analysis (Krippendorff, 2004). Each voice record was transcribed into Excel sheets. Then, open coding was conducted to identify data related needs and expectations of participants (Strauss & Corbin, 1990). During the coding process, to maintain the consistency, the first coding was done only by the interviewer. For assessing reliability of the coding (Krippendorff, 2004), another researcher went through the codes. An iterative process was carried out until an agreement was reached.

Using the explained analysis technique, 623 data related comments were listed. In total 5 main dimensions were defined with 27 type of running related data. The qualitative analysis technique enabled understanding the relations between dimensions of data experience and type of data that is

Table 1. The Apps and the Sports Watches that Participants Used.

	Tracker being used	# of participants
App Users	Endomondo	3
	Nike Plus	3
	RunKeeper	1
	Strava	2
Watch Users	Garmin Forerunner 220	9
	Garmin Forerunner 910XT	3
	Nike Sports Watch	3
	Garmin Forerunner 25	1
	Garmin Fenix2	1
	Garmin Fenix3	1
	Suunto Ambit 3	1
	Suunto Ambit 2	1
		1
	TOTAL	30

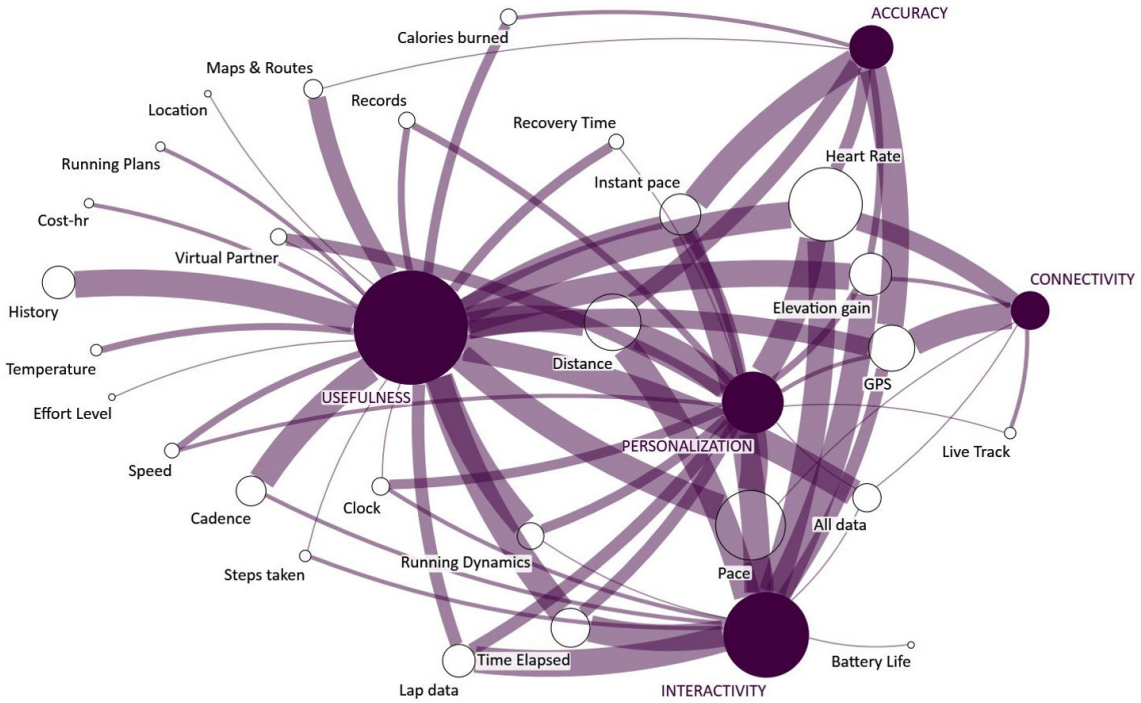

Figure 1. Relations between the Components of Data Experience.

related with that experience. Incorporating the relations between those will lead to learn the dynamics of data experience of runners. To do this, the number of comments were used to create the graph of relations. For this, "NodeXL (Smith et al., 2009) network graphs creating software was used. The outcome graph is aimed to understand the emphasis of relations and to figure out the potentials of further research. In this graph, the sizes of the circles indicate the strength of the dimension or type of data in comparison to others. Besides, the strength of the lines indicates the strength of the relation between the quality and the characteristic. The distance between the circles does not have any significant meaning (Figure 1).

It was realized that runners' data experience were mainly under five main dimensions: *usefulness*, *interactivity*, *personalization*, *connectivity* and *accuracy*. As expected, participants talked about the usefulness of data more than other qualities of data in their experience. They talked about the type of data they need and reasons behind those. Second, they talked about interactivity of data which was declared to be an important quality in their data experience. Third, they talked the personalization of data; how the data talks about the user and how it should further be personalized. They also talked about the data connectivity and accuracy, as these also define the way they know about self.

The Figure1 illustrates that, *heart rate, pace*, *distance*, *GPS*, *elevation gain*, *instant pace* and *time elapsed* are the most important data that runners care most. The data showed that all participants (n=30) talked about heart rate, pace (or speed), distance and time while they talked about their data experience. On the other hand, lap data (n=13), elevation gain (n=12) and training history (n=12) were also mentioned by the participants by relating these types of data with the dimensions listed above. In the following lines, the details of the dimensions will be discussed.

Usefulness of data

The first dimension of data experience is usefulness, that can be defined as the "system's ability to inform the user with the required data before, during and after running".

Data from the study revealed that runners care about usefulness of the *heart rate*, *pace*, *distance* and *cadence* data as well as the overall *historical* summary of these. It was stated that, *heart rate* is the most important data, as it indicates whether the runner is training within the limits of "safe-zone" or not. That is, when the heart rate is too high, it may be the indicator of heart problems. Amateur runners use their *pace* data mostly during running to assess whether their heart is in safe as it was stated to be one of the most important indicators of effort level. It is also stated to be an indicator of "healthy run". Following that, amateur runners would like to reach the *history* of their runs, to be able to compare their performance with the previous runs. This also is required to understand whether their performance is improving or not. *Distance* and *pace* data are mostly used during running. Obviously amateur runners would like to know about the distance and speed they run, and to decide at which kilometer they would stop running. Interestingly, participants mentioned about the usefulness of *cadence*, the number of steps taken per minute. Those who talked about the usefulness of cadence data, would like to keep their cadence at a certain level to avoid the injuries.

Elevation gain data was mostly mentioned by the participants who train for trail races. For those participants, it was stated to be more important than pace data as their pace can change when they go up hills and they mostly don't care what their pace was in a run, but the elevation gain. Finally, *time elapsed* was stated to be important by a few number of participants. It was because, when the runner knows about the distance and pace, how much time elapsed can be guessed.

Interactivity
The second dimension of data experience is interactivity, means "the system's ability to communicate with the user, who expects to connect to the system whenever they desire."

Data from the study revealed that runners care about interactivity of their *pace*, *distance*, *heart rate*, *elevation gain* and *instant pace* data mostly. It was stated that, interactivity of *pace*, *distance* and *heart rate* are required during running, in order the runners to instantly check the details of their run. As these three types of data are stated to be the indicators of "safe-zone" running, they are expected to be interacted smoothly and directly when needed. As the trail run lovers care *elevation gain* data, it was stated that interactivity of elevation gain data during running is critical for them, especially when they train for special races that has high elevation gain. Finally, importance of interactivity of *instant pace* was stated mostly by road runners as they define their race pace by comparing their instant pace with their target race pace during running. Mainly knowing instant pace helps the runner avoid going too fast or too slow during running.

Personalization
The third characteristic is personalization, which can be defined as "the system's ability to allow the user to make changes in the information content" to best support individuals' needs.

In the study, it was discovered that runners wanted the system to "talk to" them specifically, rather than just collecting data and analyzing it according to pre-defined parameters. They wished the system to make suggestions for their training by analyzing their data, and expected the system to adapt itself to its users in relation to their changing needs and goals. The participants described how personalization is important for interactive systems, because personalized information strengthens the feeling of ownership of the system and inspires extended use. In addition, participants expected the trackers to allow them to personalize the interaction with the data. They expected to see their *pace* and *heart rate* instantly during running. Therefore, while talking about the user specifically, the system should allow the user to personalize the interaction so that the runners can reach the type of data they need.

Connectivity
The fourth dimension is connectivity, which is defined as "the "system's ability to connect with other media to be able to make correct calculations."

Connectivity is important in order to engage the runner with the tracker frequently to make meaningful interpretations about one's self. Through adaptive technology, instant data access should be ensured to enable runners analyze their personal data immediately, and take instant steps to overcome the unexpected results. For instance, checking data instantly and seeing the instant pace correctly can result in taking action to avoid any injuries. On the other hand, participants stated that some of the systems lack instant GPS connection which results in lack in accuracy of some of the data.

Accuracy
The final characteristic is accuracy, which is defined as "the system's ability to collect and show data correctly."

All participants expected the systems to give accurate data. Accuracy in the data measurement identifies the level of people's reliance on the system. It is also influential of usefulness and interactivity data. Accuracy comes into prominence as runners expect the system to "talk about them specifically". Lack in accuracy of the data results in a barrier to keep using the system. This is because, people think that there is no sense to continue using a "useless" system. In relation to the previous findings, results indicated that runners care for the accuracy of instant pace and GPS-connection. In some models of sports watches, even though it has high importance, the *instant pace* data is not accurate enough for them to track it. It is because, the GPS connection is not accurate enough to track the runner live.

Implications for design

In this paper, five dimensions of data experience has been presented which were derived from a semi structured study conducted with 30 amateur runners. Trackers that are designed to support these dimensions will likely to offer holistic and engaging data experience. While each dimension can serve as a mechanism for creating rich experience for different types of trackers, these five dimensions can also work together to sustain long term experience for single set of system for all amateur runners.

Products and systems can offer features that are adaptive to runners' changing goals. They can also take individual differences, such as general wellness, injury, and illness, into consideration. The feedback that the tracker presents should be designed in a motivating manner and be presented in real time. To design an interactive running tracker that offer rich data experience in relation to the five characteristics, designers should consider the following:

1) Connectivity is a requirement, as it keeps people trust in personal data. The interactive running tracker must offer several simple and direct ways to access data, and data access should transfer seamlessly between access points. Current Bluetooth or wireless technologies can be utilized to satisfy the needs of the runners. It should also react according to a runners' changing contexts of use. For instance, when the runner travels to another city or country, it should not

need any adjustment to connect to the GPS. There should also be no delay in connecting to the system and accessing one's data by sustaining accuracy of data. This requirement is extremely essential for runners as instant and accurate data access is a means for runners to trust in both the system and personal data.

2) Data visualizations and interaction with data should be designed to support usefulness and interactivity of data. Here the aim is to keep runners' interest in learning from the tracker and be curious about "what comes next". For example, the system should offer a number of ways to present and make meaning from the data. During running, it obviously should give the details of the run that the runner requires. So it would be easy for the user to understand where he or she is relative to a goal, if there is one. It can also make suggestions during running if the runner is behind a predefined goal. As stated, heart rate is the most important data, which indicates whether the runner is training within the limits of "safe-zone" or not. The tracker should be extremely careful in presenting the heart rate data to the runner in order not to cause irrelevant disturbance. Presenting data in real-time and accurate also keeps runners motivated and curious about the momentary data.

3) Personalized information and interactions offer more engaging data experience. As discussed, a tracker that delivers personalized information will empower the runner to take action immediately. Prompts or incentives that have been tailored to an individual keep runner motivated to work towards their goals. Other forms of personalized interactions can include incentives or inspirational information. A design for personalization is not static; it needs to be tailored periodically to stay in tune with a runners' changing goals. For example, the system can tailor the advice given, based on improvement and shifting goals. As an example, the tracker can adjust itself and give advice accordingly, if the runner misses a training or when the weather is too cold to go for a run.

Conclusion

In this paper, the dimensions of data experience of amateur runners in relation to their data requirements were explored. Even though there are studies that explore how people experience fitness trackers, the novelty of this study was the exploration of the importance of "data experience" for amateur runners and perhaps more interesting the relations between the type of data the amateur runners expect to see and the qualities of data.

With this research agenda, it was hoped to explore how to better design systems to offer engaging experience and to improve runners' training. It was found that usefulness, interactivity, personalization, connectivity and accuracy of data are the main dimensions of data experience of amateur runners. Future trackers could go beyond the simple display of information to include personalized prompts for individual runners or case-specific solutions. They could represent a person's ideal self in terms of who they want to be, satisfy them emotionally, and prevent them from becoming injured during running. They could offer data features that people can customize to their personal needs. By understanding the specific runner, the tracker needs to adapt itself to runners' expectations. In this way, a tracker can analyze personal data and make suggestions accordingly.

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