

A Universal Health Tracker: How People can Gain Big Picture Health Insights on Atomic Data

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Abstract

Many people track parts of their lives to gain certain insights on their health using mobile apps. Although variables such as the number of steps, hours of sleep, diet, and other data offer some level of awareness, they do not provide users a full picture of their well-being. For instance, it is difficult to see how a certain food group affects sleep unless all this information is loaded and utilized under one app. Or how do external factors such as weather affect one's mood? Therefore, I propose a universal platform agnostic health tracker app to track all of these metrics, gain insight from all the different trackers and apps, and output one predicted overall health score using machine learning. Previous trackers and tracking apps are extremely atomic - they can only provide insight on one specific metric. Online forums where crowdsourced information is shared and basic web applications have been made but are not yet mainstream and limited in overall insight. By combining every insight together and providing an overall picture, it could allow seemingly unrelated data to connect and demonstrate certain patterns to users. In the future, this app could move into other projects such as a smartphone focused for tracking these metrics or inspire current health apps and APIs to become more

uniform in data formatting so more innovation can be made.

1. Introduction

The concept of digital health tracking is an increasingly mainstream trend. Sixty percent of U.S adults track their weight, diet, or fitness and 33% monitor variables such as blood sugar and sleep patterns [3]. This technology empowered patients with knowledge about their own health and disease management that was previously only accessible to medical professionals. Therefore, patients and medical professionals could bridge the gap between them and take a shared active role in making medical decisions [2]. Outside of the healthcare side, people are taking their own course of action by purchasing technological trackers such as smart watches and heart rate sensors that sync with smartphone apps.

Currently, most digital health apps are siloed into specific categories such as "sleep tracker" or "diet diaries". These apps only provide a magnified narrow insight. For instance, within MyFitnessPal, users can observe the macros they ate, the micronutrients they are lacking, and other useful data on the food they consumed. Many apps function in this atomic realm, but how can we bridge the gaps between all

these apps to reveal the most important information: our overall health. Masses of an individual's unique health-related data is not enough, the insights and trends that people retrieve are the goal.

Many studies also demonstrate that providing this opportunity to self-track can genuinely improve health and wellness outcomes as well as ignite a psychology of empowerment and responsibility among individuals [1]. Smart digital health tracking reveals to users how their body and subconscious mind are interlinked as they go through their day to day activities. In short, what gets measured gets managed.

Most app capabilities developed in an effort to check our health are atomic and in-depth but not broad sweeping. Few organizations and companies in the digital health space are developing methods of gaining big picture insights of our own personal health to provide to general users. Many companies such as Apple and Fitbit have hundreds of thousands of data points from their users' tracking devices to improve specific health metrics such as Electrocardiogram (ECG) monitoring [1].

While electrocardiogram monitoring will become more and more reliable as algorithms better predict output results for users, there is still a need for overall health information. While subjective from person to person, other companies can take the same approach as Apple and Fitbit and gather enough data points so in the future, they should roughly be able to guess a person's health trends or gather at least general recommendations. As shown in Figure 1, unofficial online forums and apps such as "<https://quantifiedself.com/>" and "<https://exist.io/>" are leading these efforts to

crowdsource health trends for the public so we can all better predict our overall health.

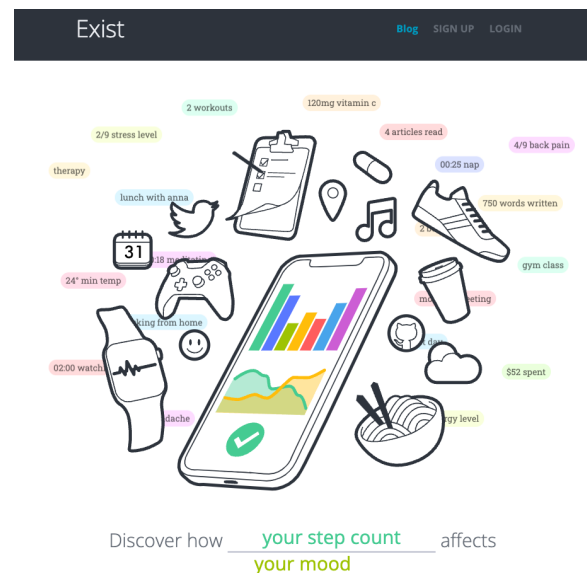


Figure 1. Picture of Exist.io app

2. Related Works

Masoomi and Handberg (2019) discuss the evolving role of smart devices in modern medicine. They make the point that the sensors on smartphones as well as their ability to connect to other devices provides data that may be instrumental to patient care in the future. Their advocacy encouraged my support for use of these devices in order to track user data related to health.

Meskó et al (2017) study the concrete ways in which digital health is transforming the relationship between the patient and healthcare providers. The paper provides steps in which hospitals and companies have used apps to communicate health protocols in order to reduce disease/illness management costs. The paper also discusses the potential future it has in our world.

Swan (2013) discusses the trend of the “quantified self” (individual engaged in self-tracking) and the potential implications and futures from becoming a quantified self. Swan shows readers how data being collected is currently being used and how it may be used in the future He also provides thoughts on the accuracy of trackers, data privacy and sensor viability. The information Swan provided has made me realize not only the vast potential behind measuring personal data but also the responsibility comes with it from both users and organizations.

Raghupathi (2018) analyze the trends of chronic diseases across different demographics and regions in the United States with cross-analysis. The scope and level of impact chronic diseases had on human lives and the economy was emphasized in this study. The researchers also emphasized the correlations between user life choices such as preventive health and behavior habits with chronic conditions. The deep level of insight made me realize the importance of a solution to curb this crisis.

3. Potential Process Design

The following section provides my hypothetical design and architecture of an ideal health tracker app.

3.1 Technologies to Build App

Multiple pieces of software tools, frameworks and libraries will be utilized to build the Universal Health Tracker app. The software Figma, an interface design tool, will first be used to design the initial graphical layout of the app. Next, I plan to use LucidCharts, a UML (Uniform Modeling Language) diagram creator to plan out

different software components that the app will use to run seamlessly.

Finally, the stack of software technologies to use to build the app will be React Native and Firebase. React Native will be used for cross-platform development as well as the crowd-sourced open-source libraries for certain features such as syncing other app data and different theming. Firebase will be used as a method of securely storing user-health data in the cloud.

3.2 Design and Functionality of App

The design of this app will be extremely similar to popular well-being apps such as FitBit and Apple Health in that it will display data collected over a period of time However, these apps can only display data and not predict an overall trend. The universal tracker app will require input from other trackers and apps using an API that can convert different data formats to be usable to the app (See Figure 2).

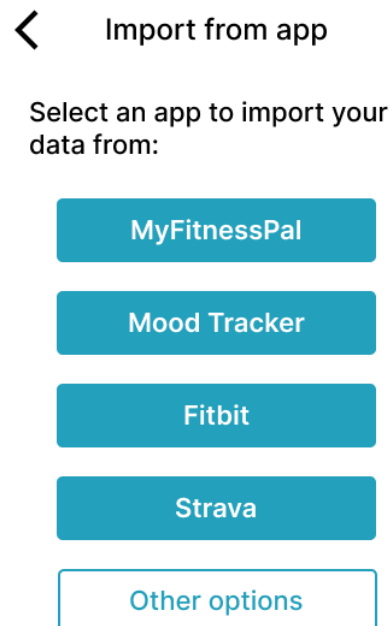


Figure 2. Screen to Import Data into Tracker

This data will be inputted into a function that returns an overall well-being score based on the multiple health factors that affect one's health. In Figure 3, the representation of one's day is displayed and the gradients of values demonstrate the gap between a person's ideal targets that the app has configured them to reach.

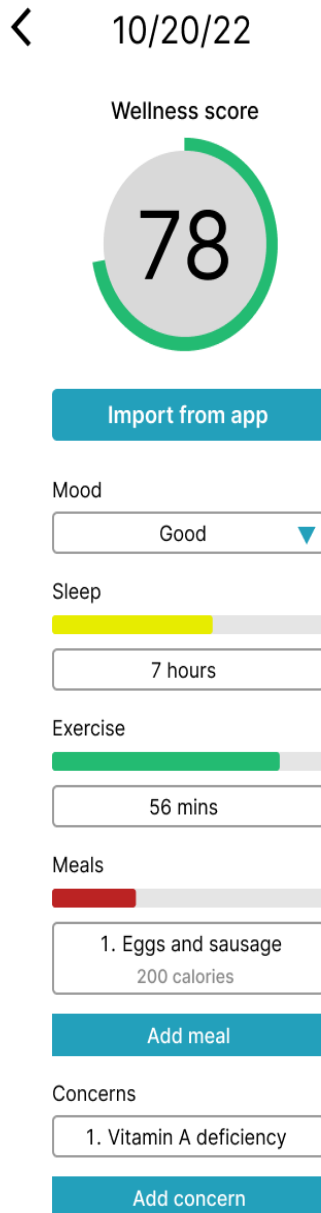


Figure 3. Screen for insights and wellness score in Tracker

Finally, the app will provide information about flaws and concerns regarding one's health along with ways to improve it. By clicking on each concern, users can find concrete solutions to fixing their problems, as shown in Figure 4.

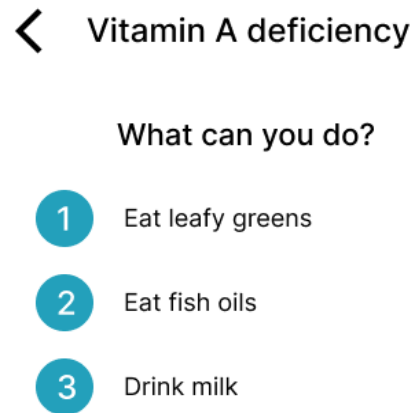


Figure 4. Screen for insights and Wellness score in Tracker

4. Potential Results

When a Universal Health Tracker App becomes available to the general market, it will bring many potential changes in people's mindsets and physical well-being. This app will allow people to enhance their awareness of all their personal habits and actions.

In an ideal tracker app, knowledge as a barrier of entry will no longer be a factor in personal health. Understandable suggestions and information will be provided to users who will have the ability to create personalized goals and plans to fix their health and mental issues.

This can also result in healthcare workers such as doctors and nurses playing a role less about informing and more about providing care that patients could not do themselves. The freedom of knowledge brings users more responsibility for taking care of their long-term health. As 75% of healthcare costs are due to chronic conditions, this app will help drastically reduce costs of the healthcare industry [4].

5. Conclusion

The concept of a universal health tracker app being implemented will result in dramatic shifts in how people conduct their lives. As people now have a tool to provide suggestions on leading healthier lives, improvements to overall well-being of a population will occur. Therefore, the emphasis for patients would be more on prevention of diseases. As a side effect, the healthcare system will become more efficient as less time will be dedicated to diagnosis and testing while more on actually curing them from the unlucky chance they do occur. Well-being is the foundation for a person to live a good life and this app will provide that foundation, allowing people to focus on the finer aspects of life including relationships, memories, and more.

6. Future Work

The next phases of this future project involve making this tracking app a standard across mobile platforms. This could either be done with independent mass adoption from users or persuading mobile phone companies to provide this app as a default on devices. As more and more apps and health tracking devices are constantly being created and updated, the extensibility

feature of the API (which allows trackers and apps to connect to the app) will also need to be updated to continuously ensure proper compatibility. Similar to Google branching off to physical devices once their software reached mass adoption, the universal health tracker app may extend itself to a universal health tracker device which may not require third-party data.

7. Acknowledgments

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