Developing a smartphone app for tracking digital biomarkers of low back pain

DEVELOPING A SMARTPHONE APP FOR TRACKING DIGITAL BIOMARKERS OF LOW BACK PAIN

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Introduction

Low back pain is among the leading causes of disability worldwide [Vos, 2017] and in most cases the cause of low back pain is unclear [Hartvigsen, 2018]. An important step towards better understanding of low back pain would be to monitor a large number of individuals during the entire courses of low back pain episodes.

We are developing algorithms and digital technologies to facilitate continuous monitoring using smartphones and wearable sensors. Using these technologies, we aim to identify different trajectories in the progression of low back pain and markers that can describe these trajectories. Based on these findings, we aim to develop algorithms for personalizing mHealth interventions for low back pain.

Methods

Our smartphone application will provide a set of behavioural and health related challenges to the users. It will allow users to track their progress with each challenge (e.g. physical activity) and compare their data with those from other users (Figure 1). The app will be freely available in the app stores and advertised through various media channels. The embedded sensors on the phone will provide means to objectively track the users' behavior. Furthermore, specific questions about back pain will be prompted.

We will analyse these data using machine-learning techniques and develop algorithms to predict disease development. In a second study phase, the app will suggest personalized app contents to individual users, based on the developed algorithms.

Results

The smartphone application is currently under development, and will be released for beta-testing in the coming months. We have developed first algorithms to extract user behaviours from mobile phone's sensor data [Schwab, 2017].

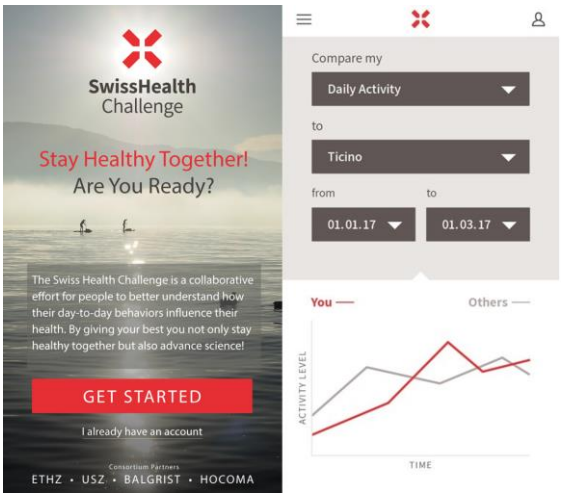

Figure 1: The Swiss Health Challenge App www.swisshealthchallenge.ch

Discussion

Passively sensed smartphone data has been leveraged for different health topics [Cornet, 2018]. Mobile tools enable to increase efficiently otherwise limited sample sizes and will provide insights in everyday behaviours related to the development and progression of low back pain. This study will provide further insight on how personalized mHealth tools can support self-management of low back pain and how ethical challenges emerging from the application of novel technologies and methods can be addressed.

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References

Vos et al, Lancet, 390:1211-1259, 2017.
Hartvigsen et al, Lancet, 391: 2356-67, 2018.
Cornet, J Biomed Inform, 77:120-132, 2018.
Schwab et al, RECOMB/ISCB Conference on Regulatory and Systems Genomics with DREAM CHALLENGES 2017, 2017.