# Proactive Sleep

## Reducing the Costs of Data Collection and Increasing the Benefits of Data Access

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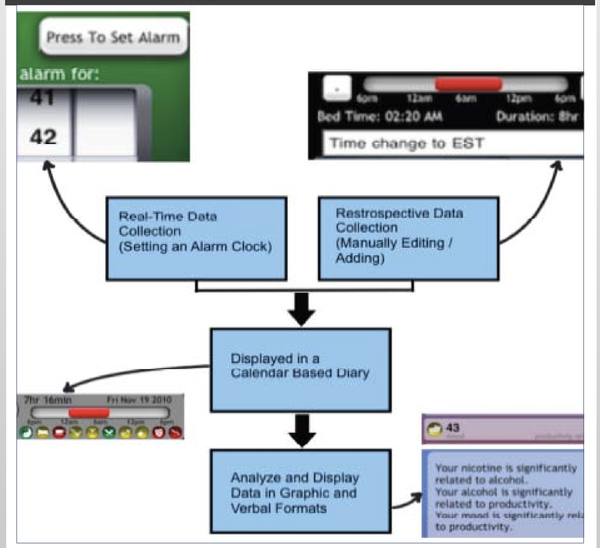
## Abstract

The goal is to develop the best possible data collection tool. Currently there are many non-invasive tools on the marketplace that collect data in real-time. The smart phone can interface with these devices and act as the central processor for the aggregated data. But not all real-time data is accurate, making retrospective data editing an important feature of a data collection device. We provide an overview of the current Proactive Sleep application, available for iPhone and Android, and explore the pros and cons of different retrospective editing interfaces.


## Application Overview




## Old Retrospective Editing View


*Sleep can be adjusted and habits are on a 1-3 scale*

## New Retrospective Editing View


## Diary Display


Sleep and habits are displayed. Pressing on a cell brings up editing.

## Analysis and Feedback


Get information on your averages and how your habits correlate

## Results and Conclusion

Retrospective editing of data is an important part of any data collection device. When developing a retrospective editing interface, it is important to consider both the time costs of entering the data and how intuitive and direct the questions are. We found that the modified retrospective editing interface was an improvement over the old retrospective editing interface due to the questions being more intuitive. While it took users longer to enter their habits using the new interface (~40 seconds) than the old interface (~30 seconds), users rated the new interface as easier and more satisfying. An explanation for this finding was that the new interface included specific questions about habits, which made the habit probes more intuitive (i.e. instead of asking if you smoked a healthy or unhealthy amount, a quantifiable question was asked that conformed to how people thing about cigarette use).

We demonstrate an application that combines retrospective editing of data with real-time data collection. Real-time data was accrued through the act of setting an alarm clock. This data was then sent to the diary, where it could be retrospectively modified. Combining both methods of data collection is novel among data collection tools. Real-time data is not always accurate, making it important for users to be able to modify it. Additionally, users may forget to use the real-time data method, and can then retrospectively enter their data.

Meaningful data access is a feature that is often missing from quantified self projects. Often times, a huge amount of data is gathered, but it is unclear how to validate patterns in the data. Some patterns are so clear that statistics are unnecessary, but other patterns are not so clear – making an automated analysis important. Automated analysis of data may also be important to sleep clinicians and psychologists who are interested in evaluate their patient's progress – for more personalized healthcare.

The Proactive Sleep application demonstrates how data access can be made more meaningful, by automatically calculating correlations between all of the behaviors collected. After three weeks of using the Proactive Sleep application, it determined that nicotine was related to alcohol use, alcohol use was related to productivity, and mood was related to productivity. More meaningful data access can promote user compliance, thereby increasing the accuracy of the data.

As technology becomes increasingly ubiquitous, there are increasingly more opportunities to non-invasively collect real-time data. We introduced one real-time data collection mechanism into the application (setting an alarm clock to track sleep), but other mechanisms can also be included. For example, we are conducting research with PLX Devices – the manufacturers of consumer based EEG headsets – in order to determine how EEG can be used to collect data on sleep. We also envision interacting with other devices and aggregating and analyzing the data on the smart phone. Since smart phones are frequently on a user's person and have access to the Internet, they have the potential to be the centerpiece of a data collection infrastructure that can be used to make easy the collection of repeated, longitudinal and meaningful data.

The Quantified Self
self knowledge through numbers