Identification of Stratified Social-Behavioral Markers in Neuropsychiatric Disorders by using smartphone technology

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Facts & Figures

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Introduction:
The concept of passive behavioral monitoring (digital phenotyping[1]) data is characterized by the unobtrusive, and continuous collection of social and behavioral data. This data is collected in real-time and within the natural environment of individuals. The social and behavioral data is collected by utilizing the rich temporal trace of social and behavioral data that is generated as a by-product of smartphone sensors.

We have developed a passive behavioral monitoring application, called BeHapp (https://behapp.org/). This application collects the temporal trace of behavioral data by using the large extent of smartphone sensors available (Figure 1).

Figure 1: BeHapp data modalities

Call History
SMS/Messaging History
Interval based WiFi Scans
Interval based Bluetooth Device Scans
Location Data
App Usage
Accelerometer
Ambient noise
Ambient light

Aim:
Our aim is to identify objective and quantitative measures for aberrant social behavior in neuropsychiatric disorders by using smartphone data.

Methodology:
A total of 82 age- and gender-matched participants collected BeHapp data. These participants installed BeHapp on their own Android smartphone. In total we included:
• 16 Alzheimer’s Disease (AD)
• 15 AD Controls
• 28 Schizophrenia (SZ)
• 23 SZ Controls

These participants are included over three different ongoing studies. For the preliminary results we used three smartphone modalities to generate features that relate to social behavior. These modalities include application usage, communication logs and location data. Features are based on previous literature [2,3,4] and log transformed for normality when needed.

Results:

Figure 1: AD and SZ patients spent more time at home.

Figure 2: SZ patients call more frequently with the same persons

Figure 3: SZ patients call significant more

Value of IMI collaboration:
As a result of the networking opportunities in IMI we were able to create awareness of our application in IMI associated institutes. As a consequence we collected data from variety of patients populations which allowed us to obtain relevant and unique behavioral insights for these populations.

Impact & take home message:
Visual inspection of the individual features suggest disease specific changes in the social behavioral patterns of neuropsychiatric patients. In addition, we also conclude that passive behavioral monitoring is a new and capable method for measuring specific changes in human behavior.

BIBLIOGRAPHY

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