OPTIMI – Online Predictive Tools for Intervention in Mental Illness

Mental disease is one of the greatest personal, societal and economic problems of the modern world. With mental health care already representing over a third of the cost of health care in the EU, health services struggle to keep up.

The most common of all mental disorders is Depression, a disease that causes immense individual and family suffering. The goal of OPTIMI is to contribute to the prevention of Depression.

Why OPTIMI?
Currently the main treatments for depression are drugs and evidence-based Cognitive Behavioural Therapy (CBT). Clinicians have few options for prevention; the only available tools for early diagnosis or for measuring the effectiveness of interventions are standardized questionnaires. OPTIMI aims to improve this situation.

Depression is often associated with poor coping in the face of stress. This means that if we could detect poor coping, we might also be able to prevent depression. Based on these premises, OPTIMI has set itself two goals:

1. The development of new tools to monitor coping in individuals exposed to high levels of stress;
2. The development of online interventions to improve coping, reducing the risk that poor coping will lead to depression.

How does OPTIMI work?
OPTIMI has developed technology-based tools to monitor subjects’ physiological and cognitive state in their natural environment. These include wearable sensors to measure EEG, ECG, physical activity and sleep; tools for voice analysis (depression is associated with changes in voice tone) and an electronic diary. We have also developed a new technique, making it possible to make continuous measurements of cortisol – a hormone closely associated with stress.

At the end of last year, OPTIMI successfully conducted three “calibration trials”, with 95 participants in Switzerland, Spain and China.

During the trials, the project team used its tools to collect daily information from participants. It then matched the data provided by the tools against results from weekly interviews with clinicians, based on standard questionnaires for stress, poor coping and depression. Finally, project used machine learning techniques (Artificial Neural Networks) to identify patterns that predicted high stress, and poor coping.

The results of the calibration trials allowed OPTIMI to develop a software Prediction tool to predict users’ risk of depression. In about 85% of cases, the predictions matched the clinician’s evaluation – an impressive performance.

This phase of the project is now complete. The next focus of the project will be on our second goal: prevention. The idea is to integrate the OPTIMI sensors with two existing systems of Computerized Cognitive and Behavioral Therapy, using them to provide users with feedback about their progress and as a source of biofeedback during relaxation exercises. Between April and May 2012, we will begin small-scale trials, in UK and Spain, measuring how far the two systems can help participants exposed to chronic or acute stress. As part of this work, we have developed software allowing participants to access the
programs not only via PCs but also from their mobile devices (mobile phones, tablets etc.)
If the trials are successful, the partners plan to organize larger-scale Randomized Clinical Trials.

Achievements so far
The first two years of the project have been remarkably successful. On the sensor side, we have developed low cost, wearable sensors for EEG and ECG that are stable enough to be taken up for industrial production. Our innovative method of continuous cortisol measurements has demonstrated strong potential both as a research tools and as a medical device (e.g. for use in intensive care).

Perhaps more importantly, we have demonstrated that, as we hoped, the OPTIMI sensors can provide an effective way of characterizing subjects’ physical activity and sleep quality and that they can provide useful information on stress and coping.

The success of the prediction tool is a sign of the strong potential of OPTIMI technologies.

Partners
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- Universitat Jaume I Castellón, Spain
- Universidad Politécnica Valencia, Spain
- Lanzhou University, China
- MA Systems and Control Limited, UK
- Universitätshospital Freiburg, Germany
- ETH Zürich, Switzerland
- University of Bristol, UK
- University of Zürich, Switzerland
- XIWRITE SRL, Italy
- Ultrasys PLC, UK
- Institut Für Response Genetik, Switzerland

OPTIMI in a nutshell
Timetable: January 2010 – December 2012
Total cost: € 5.2 million
Total EU funding: € 3.7 million
Funding instrument: Collaborative Project
Project Identifier: FP7-ICT-2009-4-248544
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