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**P.4.003 Mood instability and reward processing: daily remote monitoring as a modern phenotyping tool for bipolar disorder**

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**Introduction:** Mood instability is a prominent feature of bipolar disorder (BD) and other affective disorders [1]. Recent research has begun to highlight a strong association between mood instability and cognitive processing, particularly within the decision-making and reward-processing domain, suggesting the ability for mood to bias perception of reward and loss, and to induce risk-taking behaviour [2,3]. However, whilst this has provided an interesting first-line understanding of the phenotypic nature of BD, research to date has failed to explore the complexities of this relationship over a longitudinal basis. Modern technologies, such as remote online platforms, can address this issue by using high frequency and prospective monitoring. This is particularly important given the dynamic nature of mood instability [4] and the expanding need to understand its underlying neural mechanisms in order to develop new and better-suited targets for treatment [1].

**Aims:** Given the emergence of new technologies and the ubiquity of internet access, we aimed to assess whether remote monitoring can capture dynamic mood instability in individuals showing dimensions of BD as measured by the Mood Disorder Questionnaire (MDQ) screening tool, and whether such instability is reflected in risk-taking behaviour in a longitudinal decision-making and reward-processing task.

**Methods:** Remote mood and cognitive monitoring over 10 weeks, as part of the Cognition and Mood Evolution across Time (COMET) study. We analysed data from 37 participants scoring >7 on the MDQ (high MDQ group) and 35 matched controls (MDQ<5). Mood was assessed on a daily basis using the PANAS scale on an iPad. Participants also completed a decision-making and reward-processing gambling task, “Wheel of Fortune”, on the iPad, where they were asked to pick the best out of 2 gambling options, with the aim of winning as many bonus points as possible. Repeated measures ANOVAs were used to analyse mood and cognitive task data.

**Results:** The high MDQ group showed greater variability in their PANAS positive affect, $F(1)=15.56$, $p<0.001$, and negative affect, $F(1)=15.01$, $p<0.001$, scores compared to the controls. They also reported greater average negative affect scores, $F(1)=14.46$, $p<0.001$, but were no different in their average positive affect scores.

Whilst the high MDQ participants did not show a significant bias towards riskier decisions in the gambling task in these preliminary analyses, all participants appeared to make less risky choices, $F(5.00)=7.42$, $p<0.001$, and were less variable in their choices, $F(4.81)=2.50$, $p<0.05$, across time.

**Conclusions:** Longitudinal daily remote mood monitoring captures mood instability in individuals showing dimensions of BD. Concurrent monitoring of cognition, particularly within the reward processing domain, suggests a pattern of dynamic decision-making and warrants further sophisticated analyses to better elucidate the cognitive underpinnings of such mood instability. Nevertheless, findings add to the increasing evidence for mood instability as a marker for BD, and suggest the efficacy of remote monitoring as a modern phenotyping technology in prospectively assessing mood instability and associated cognition. This will aid in the search for biomarkers that can be used in determining the effectiveness of current treatments and in the development of novel therapeutic targets.

**References**


**P.4.004 Passive behavioural monitoring in neuropsychiatric disorders using smartphone technology**

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The majority of medical disciplines utilize a measurement-based approach for the prevention and early detection of major medical events by monitoring measures that indicate the onset of such an event. However, in psychiatry treatment is often preceded by a major psychiatric crisis or
even hospitalization and is followed by a long period of disability and slow recovery. The focus on acute care in psychiatry is due to a lack of valid temporal and objective measures of behavior that translate into day-to-day functioning. Several Behavioral changes in day-to-day functioning are identified as prodromal symptoms for several neuropsychiatric disorders [1,2]. A measurement-based approach is needed in psychiatry to monitor daily functioning and improve patient outcome [3].

Therefore, we have developed a passive behavioral monitoring (PBM) application, called BeHapp (https://behapp.org/), that collects a rich longitudinal trace of real-world social and behavioral data with minimal awareness. PBM is based on the ubiquity of smartphones, and monitors behavior by utilizing the large extend of smartphone sensor modalities available. These modalities allows us to formulate several features related to social behavior, e.g. number of contacts, duration of phone calls, social media usage, and places visited. We studied the predictive power of PBM in differentiating between non-diagnosed controls and neuropsychiatric patients by using smart phone modalities that relate to social behavior.

We collected preliminary data from 24 neuropsychiatric patients (9 Major depression, 11 Schizophrenia, 4 Alzheimer’s Disease) and 72 non-diagnosed controls by installing BeHapp on the participant’s own android smartphone. Participants were included over several different ongoing studies and psychiatric screening data was available for 20 non-diagnosed controls. Average participation time was 13.4 days (sd = 5.9), variation is due to early removal of the application. We used GPS, application usage, and WiFi data to generate features that translate into daily social functioning. Simple two-sided t-tests were used to evaluate the difference in means between the neuropsychiatric patient and non-diagnosed control group. Additionally, we applied t-distributed stochastic neighbour embedding clustering [4] to group participants into a two-dimensional space regardless of their diagnosis.

Our preliminary results revealed social-behavioral differences between the two groups (pooled patients versus controls) in social media usage; frequency of WhatsApp usage (p < 0.001) and Facebook usage (p < 0.01) is significantly higher in the control group. Mean Facebook time usage was significantly lower in the patient group (p = 0.001). We also found significant differences in location data, location entropy and location stay time was significantly higher in the control group (p = 0.02 and 0.03, respectively); indicating that patients have less variation in their visits to geographical locations. Our clustering approach revealed two visual overlapping clusters that partly separated the patient and control group in a two-dimensional space. Visual inspection of this two-dimensional space revealed decreased social functioning for the majority of patients.

Our results suggest that PBM is sensitive in detecting differences in day-to-day social functioning and therefore a potential candidate for a measurement-based approach in psychiatry.

References


P.4.005 Predicting the naturalistic course of depression from a wide range of clinical, psychological and biological data: a machine learning approach

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Depression is among the leading causes of disability in industrialized countries [1]. To effectively target interventions for patients at risk for a worse long-term clinical outcome, there is a need to identify predictors of chronicity and remission at an early stage. Many clinical, psychological and biological variables have been linked to different course trajectories of depression. These findings, however, are based on group comparisons with unknown translational value. A variable that is statistically significantly different between groups does not necessarily carry sufficient predictive power at the individual level, e.g. because the average difference between groups may be small or because of a high degree of variation within each group. This study evaluated the prognostic value of a wide range of clinical, psychological and biological (markers related to somatic health, metabolic syndrome, inflammation and autonomic nervous system) characteristics for predicting the course of depression and aimed to identify the best set of predictors.

We used data from the Netherlands Study of Depression and Anxiety (NESDA), including unipolar depression patients recruited from the community, primary care and specialized mental health care, thereby capturing a broad range of illness severity [2]. Unipolar depressed patients (major depressive disorder or dysthymia, N=804) were assessed on a panel of 81 clinical, psychological and biological measures and were clinically followed-up for 2 years. Subjects were grouped according to (i) the presence of a depression diagnosis at 2-year follow-up (yes N=397, no N=407), and (ii) three disease course trajectory groups (rapid remission, N=356, gradual improvement N=273, chronic N=175) identified by a