שם: פולק קרן

שם העבודה:

Multi-modal transdiagnostic framework for phenotyping and prediction of low back chronic pain and mental health comorbidity using Ecological Momentary Assessment: a cohort study.

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Abstract

Background: Mental conditions and chronic pain disorders are leading causes of disability worldwide, resulting significant suffering of patients and their relatives and imposing a huge economic burden. Among people with chronic pain comorbidity of depression, anxiety (PDA) or both is well known. This phenomenon was assumed to be static in time. However, due to the dynamic nature of pain and mental health conditions, PDA multi-morbidity may fluctuate overtime, allowing to differentiate trait-like components (static, "between-Individual" differences) and state-like components (dynamic, "within Individual"). In addition, automated analysis of human affective behavior has attracted increased attention, concentrating mostly on emotion recognition and pain. However, pain assessments based on linguistic and voice characteristics combined with data collected by wrist devices have received less attention.

Study objectives: First, we will identify trait-like and state-like components of PDA multi-morbidity over time. A predictive model of PDA multi-morbidity will be developed taking into account time trajectory and potentially psych-sociodemographic characteristics as moderators. Then, PDA trajectories will be phenotype based on the previous model. Second, PDA multi-morbidity predictive model will be developed and validated based on linguistic characteristics, daily life physiological and behavioral markers over time. Third and last objective is to construct a pain predictive model based on the results of the PDA multi-morbidity model, linguistic characteristics and markers of daily-life physiological and behavioral activities.

Methods: A cohort study among Israeli adults with low back chronic pain will be deployed. About 310 patients will be recruited using a two-stage procedure during 2 years. First, potential participants will be recruit using social media and chronic pain forums. Next, potentially eligible candidates will be contacted for confirming their eligibility and participation. Eligible patients will sign informed consent forms before being enrolled in the study. Baseline diagnostics of depression\anxiety will be performed at the beginning of the research by certificated psychologists. In addition, the relevant clinical background will be recorded. Participants will report daily depression and anxiety states, pain levels and physiological states via a dedicated web application for one month. The application will also include a video-recorded self-speech

feature, allowing users to elaborate about their wellbeing. Daily-life characteristics will be measured by a wrist-worn device.
Mixed models and associated latent class analysis will be used to investigate PDA fluctuations over time. Mixed multinomial models will be deployed for predicting 'PDA multi-morbidity' and 'Pain' using machine learning approaches such as Native Language Processing (NLP) to analyze linguistic characteristics.

Innovation\Significant: Previous studies focused on pairwise comorbidities of PDA, mostly assuming PDA comorbidity as a stationary phenomenon. The current study will investigate PDA multi-morbidity and its fluctuation over time, by applying a longitudinal framework based on devoted web application and wrist-based sensors for monitoring and tracking subject daily life events. Identifying clinically relevant factors and characterizing trajectories of PDA by applying advanced statistical and computational approaches, allow for intervention while identifying individuals at risk.
Development of multi-modal predictive models of PDA multi-morbidity and future Pain levels based on the daily-life markers and linguistic characters will contribute to the understanding of the complex link between mental health, daily life markers and pain. It can serve as the basis for psychological and pharmacological interventions addressing emotional symptoms in patients suffering from chronic pain. In addition, due to the longitudinal nature of this study, the mentioned predictive relationship between study variables might suggest quasi-causal models of future PDA and pain.